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JUNE 1947

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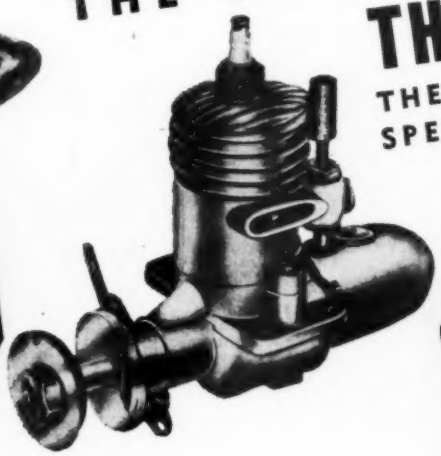

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MODEL AIRPLANE NEWS

JAY P. CLEVELAND
Publisher

JUNE, 1947 VOL. XXXVI No. 6

CONTENTS

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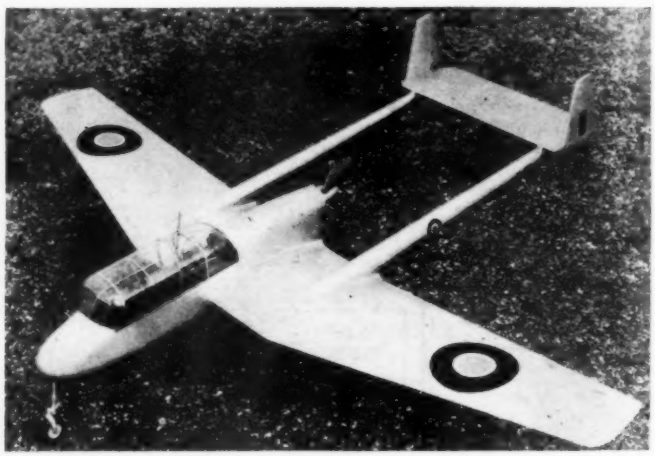
THE NORTH American XSN2J-1 advanced Navy trainer comprises an accurate yardstick of aeronautical progress. It has a top speed of 270 mph, which is considerably faster than our best Air Corps fighter of the 'thirties! As a further indication of progress this new "trainer" is equipped with dive brakes, rocket launching racks, carrier arresting gear, machine gun, oxygen equipment and has a 2000 mile range. It is powered by a Wright *Cyclone* of 1100 hp. No production plans have been revealed while the new trainer undergoes extensive acceptance test flights. It uses the famous North American trainer wing form and features a large bubble canopy for the student and instructor.

FUTURE OF THE sleek Republic *Rainbow* transport has suddenly been placed in doubt by cancellation of an order for 20 by American Airlines. This leaves only an order for 6 by Pan American Airways on the books. The cancellation automatically increases the price, which is based on quantity production. Until renegotiations of the sale with Pan American have been completed, Republic has stopped all work on the *Rainbow* production line.

IT SEEMS LIKE "old times" to again record in these pages data on new combat aircraft contracts. Latest is an order from Army Air Forces for 96 North American B-45 bombers at $73,900,000. NAA also received contract for production of 250 P-82 *Twin Mustang* fighters. The 5051 mile Honolulu-New York flight of P82B *Betty Jo* revealed the remarkable design of this odd craft which has proved something more than simply "two *Mustangs* tied together." The takeoff weight at Hickam Field was 30,000 lbs., which is more than that of a Douglas DC-3 transport! The craft lifted 2215 gals. of gas on takeoff, normal fuel load of a *Fortress!*

PRODUCTION MODEL Consolidated Vultee B-36, of which 100 are on order, will feature revised cockpit enclosure and landing gear. Multi-wheel landing gear will replace the single huge wheel now used on each strut to reduce concentrated ground

(*Turn to page* 15)



Model of observation plane to be built by Heston Aircraft for the RAF. It will carry two and has 44 ft. span. (Below) Winding up one of the high power drones. Low power ones are hand cranked, but this takes a real twist to start

GAS MODELERS! LOOK WHAT'S HERE!*

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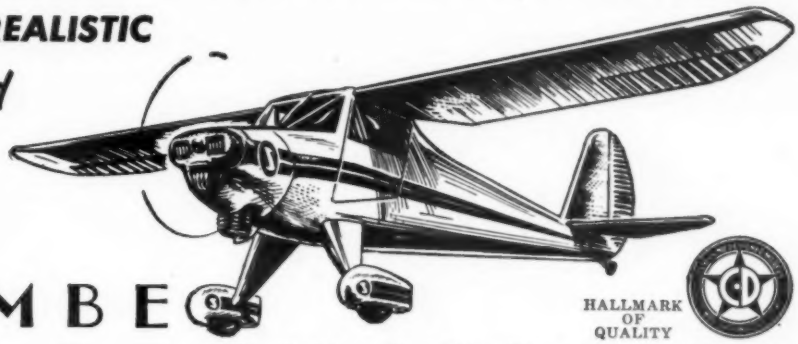

HALLMARK OF QUALITY

Cleveland's new 43" span free-flight gas model of 1¼" Scale for Class B engines is a scale replica of the real Luscombe Silvaire, which can be seen on almost any field used by private planes. Simple in construction, the authoritative Cleveland designing incorporated in this model preserves all the sleek beauty of its all-metal prototype. Though primarily designed as a Class B free-flight scale model, it is light enough to be flown with large Class A engines, and rugged enough to be used as a Class A, B, or C control-line model. If you are looking for something different in free-flight, or control models, be sure to build this nifty job. **$3.00**
Dry Kit (less power unit) GP-106 only.....

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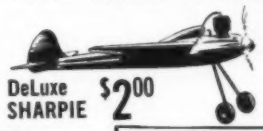

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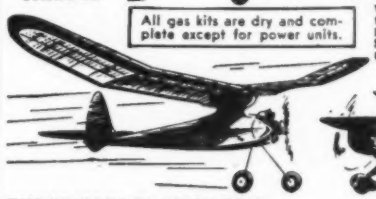
All gas kits are dry and complete except for power units.



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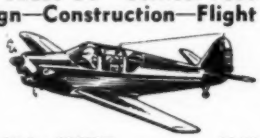

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Mr. E. D. Tullio

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Flying Scale –	1st Cedric Galloway	*Super-Cyclone*
	3rd Jerry Borden	*Super-Cyclone*
Precision Open –	1st Donald Gullato	*Super-Cyclone*
	2nd Donald Fox	*Super-Cyclone*
Jr. Precision –	1st David Silver	*Super-Cyclone*
Ladies Event –	1st Beverly Cosens	*Super-Cyclone*

There were approximately 250 entries, among them were 34 Super-Cyclone powered planes.

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Mr. E. D. Tullio, is the owner of five motors and evidently likes his 8-year old Super-Cyclone. He is a member of the Denver Model Aviation Club and here is what he says, "This ship won two firsts and one second in Denver. First in the Rocky Mountain Regional Contest. Also, first in a Colorado Springs contest. Of course, you know the record being broken at the regional contest. The motor is 8 years old."

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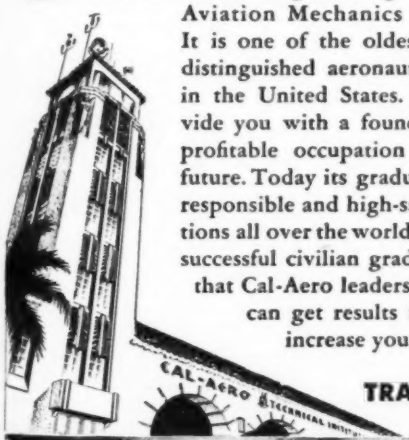

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LATEST FROM THE
ACADEMY OF MODEL AERONAUTICS

by Executive Director **RUSS. W. NICHOLS**

NEW AMA GAS model committee gets under way. Among the most important AMA committees now functioning is the "Gas Model Committee" working under the able guidance of Don Foote. With the assistance of Henry Cole, Washington (State), Carl Goldberg, Ill., Richard Verba, Ohio, and Al Lewis, New York, all suggestions for rule changes affecting gas models will be screened and referred back to the Contest Board. Don and his committee will remain in constant session by mail so all you fellows who have "super" ideas (and show us a modeler who hasn't), wrap them up and send them along to Don Foote, 816 56th St., Oakland 8, Calif. Since it will be necessary for Don to send copies of all correspondence received to each of his co-workers, he suggests that you slip a couple of extra carbons in your typewriter and send him four copies. Says it will save him no end of work.

Another point well taken by the committee is that wherever possible, suggested rules changes should be carefully discussed by clubs, and even groups of clubs where that is practicable, so they can be submitted as endorsed by a *group* rather than as the personal opinion of *one* modeler. Any set of national regulations is of necessity a "give and take" proposition which should, in final form, represent the overall recommendations of all interested and qualified individuals in every section of the country. Let's bear this in mind and get behind Don and his committee—they represent a formidable array of talent and are pledged to work with and for you in keeping the rules on the beam.

DEFINITE DATES set for Release of AMA rules changes. In order to delete for all time the phrase "When are the new rules coming out?" from our model aviation vocabulary, the 1947 AMA Contest Board under the chairmanship of Walt Good (Dr. Good that is), has definitely established November 30 of each year as the date on which *all* changes to the rules will be announced. These changes will become effective the following January 1. It was further determined that any pending revisions not announced on the 30th of November of any year must be withheld for another 12 months.

It is felt that this schedule will allow ample time for planning and building before each flying season. In the past, lack of a definite deadline for the issuance of rules has worked a hardship on many of us and we are more than pleased to see this constructive administrative step taken by the Contest Board.

TEAM ENTRIES. In the last few years, more and more building and flying teams are becoming apparent. Most of these are father-son combinations which, of course, is a most interesting and healthy development in the model aviation picture. Under present regulations team models are for the most part entered according to the age of whichever team member does the flying. In many ways this would seem to be proper and acceptable. However, as one modeler recently pointed out, it does result in many situations in which a model is expertly constructed by the elder of the team and is flown in junior or senior events in competition with models built by flyers having much less experience. It was the feeling that, in control events especially, this constituted an unfair advantage in favor of the team entry. For this reason it was suggested that a "team model" be entered according to the age class of the *oldest* member of the team. How about talking this one over and contacting Frank Greene, Chairman, Control Line Speed Committee, 928 Locuse Ave., Long Beach 2, Calif.?

AMA CONTEST BOARD votes no design changes this season. Results of the recent poll of the Contest Board indicated that the majority of members did not feel that any structural or design changes should be announced until November 1947. One of the most important questions considered was that of power loading. Present indications are that a majority of the districts favor an increased power loading to either 100 or 120 ounces but requested that no changes be made until next fall because of the lateness of this season. This question, therefore, will be reconsidered at that time.

Briefly, the following are the only revisions made to the rules. These changes became effective March 1, 1947:

1. In connection with gas models (free flight) delayed flights have been eliminated. Instead a "Disqualified Flight" is considered to occur when aided by the artificial displacement of air or mechanical takeoff assistance; when parts are dropped during launching or flight; or when the engine run exceeds 20 seconds. Disqualified flights are recorded as official but zero time is shown. In the event of a mid-air collision, the contestants involved may take an additional flight at the discretion of the contest director.

2. In connection with control line *speed models only* the pull-test has been increased from 10G to 20G. Obviously, this revision was adopted in an effort to increase the speed flying safety factor. By the time the Board reconsiders the question of safety next fall, it is expected the Safety Committee will have completed its survey and made its report to the Board. The man to contact on these questions is Tom Wardlaw, Chairman, AMA Contest Committee, Rte. 4, No. Kansas City 16, Mo.

3. A maximum number of 3 models is permitted in control line speed events. Any one, or all three, may be used by a contestant in completing his three official flights.

4. In addition to the remotely controlled pylon and the pivot disc heretofore re-

(*Turn to page* 10)

A few of the 60 active members of Jacksonville (Fla.) Model Airplane Club. While the members pictured are displaying only controlliners, the Club is also active in free flight

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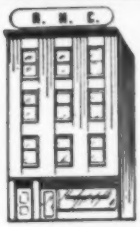

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New Thor Kit	(CL B)	6.95

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Aero Coil (Quality)	3.00
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Arden Coil	2.50
Winston Coil	2.00
Wico Coil	1.95
Regular Coil	1.50
Metal Condenser	.45
Paper Condenser	.28
Ignition Wire (6 feet)	.25
High Tension Lead Wire	.15
Spark Plugs (all sizes)	.50
Arden Booster Jack	1.25
Switch	.25
Alligator Clips	.10
Vitamite Wet Coil	2.35
Power-plus	
Flight Battery	2.75
Booster Battery	3.50
House Charger	4.45
Auto Charger	1.95
Arden Flight Timer	1.85
Austin Flight Timer	1.50
Comet Flight Timer	1.00
Hillcrest Flight Timer	1.25
Universal Needle Valve	.75
4-Way Plug Wrench	.15
Neoprene Tubing (per ft.)	.50
Spinit Starter	4.00
Aluminum Engine Mounts	.50
Flo-Torque Prop (8" to 14") (16", 18")	.50 1.00
Topping 10" Multi-pitch Prop	1.50
Topping 12" Multi-pitch Prop	1.75
Comet Props: 8", 10", 11" 12"	.35 .40
Hi-Pitch Props: 8", 9", 10", 45c; 11", 50c; 12", 13", 60c; 14", 65c.	
Snafu Plastic Prop 10" 12"	.75 .90
Topping 3 Blade Plastic Props	1.50
Sponge Rubber Wheels 2", 40c; 2 1/2", 50c; 3 1/2", 60c	
Traxler Balloon Wheels 2 1/2" 60c; 2 3/4" $1.00; 3" $1.25; 3 1/2" $1.50; 4 1/2" $1.75.	
Spray Gun 1.25 &	1.75
Modelers Plane	.75
Flywheels A or B, $1.00; C, $1.50	
Univ. Running Stand	1.25
Midget Screw Driver	.10
Hi-Tension End Clips, each	.05
Tip Jacks Set	.60
Jem Pump Can	.75
Plug Gauge Set	.15
Alum. Prop Spinners 5/8", 20c; 3/4", 30c; 7/8", 75c; 1 1/2", $1.00; 2", $1.25; 2 1/2", $1.50; 2 3/4", $1.75.	
Presto Disc Starter	.25
Bamboo paper—white, green, blue, each	.10
Wood Stripper	.25
Celluloid Sheet	.10
Austin Tank	.50
Froom Gas Tank	1.00
Winston Tank	.75

FREE FLIGHT PLANES

(FREE: See item 9 above)

For "A" & "B" Motors

Coronet 48"	$2.50
Buccaneer 48"	3.50
Buccaneer 38"	1.50
Bee 48"	1.95
Brooklyn Dodger 56"	3.95
Pacer B 53"	3.95
Topper 41"	3.50
Roamer 45"	2.95
Zombie 44"	3.00
Rocketeer 40"	2.95
Playboy Jr. 55"	2.50
Buccaneer B Spl. 54"	3.95
Jiffy 36"	1.50
Stratos 42"	2.95
Amor. Ace 54"	3.95
Banshee 50"	6.95
Wanderer 54"	3.50
Bay Ridge Mike 49"	2.00
Zipper 54"	5.95
Runt 44"	2.50
Air Failer 44"	3.95
Rogers & Wilco 50"	5.95
Zoomer 60"	6.95
Musketeer 54"	3.50
Amor. Ace 36"	1.50
Stanzel Interceptor 51"	2.98
Skyrocket 36"	2.95
Ranger 46"	3.00
Comet Interceptor 42"	3.95
Musketeer 42"	2.50
Brigadier 58"	2.95
Brigadier 38"	1.95
Aero Champ 48"	2.50
Yogi 42"	3.95
Piper Cub Coupe 40"	1.95
Jersey Javelin 48"	3.95
Larkey 50"	3.50
Mercury Jr. 50"	3.95
Good News 50"	3.95
Powerhouse 56"	4.95
Strato Streak 48"	2.50
Spearhead Jr. 44"	1.95
Mogow Piper Cub 53"	6.95
Ensign 50"	3.50
Ardent-Air 32"	2.00
Crusader 48"	7.50
Baby Quaker 35"	3.00
Humdinger 52"	3.95

For "C" Motors

Piper Super Cruiser 84"	$10.95
Pacer "C" 69"	4.95
Buccaneer Std. 66"	5.95
Buccaneer C. Spl. 72"	6.95
Super Buccaneer 90"	8.50
Mercury 72"	5.50
Playboy Sr. 70"	4.50
Stinson Reliant 78"	15.00
Musketeer Std. 72"	4.95
Cavalier 60"	5.95
Wag 60"	5.50
Vagabond 74"	5.50
Custom Cavalier 108"	15.00
Sailplane 78"	8.95
Spearhead Sr. 60"	3.95
Skybo 66"	6.95

CONTROL-LINE PLANES

(FREE: See item 9 above)

Capitol Ercoupe 40" B-C	$ 7.50
Duraplane 28" B-C	12.50
Topping 21" B-C	10.00
Snafu Ercoupe 45" C	12.50
Meteor 24" B-C	8.95
Fireball 36" B-C	10.00
Buzz 30" C	8.95
Aero Puppet 24" B-C	5.95

Controliners by Berkeley

P47 41" C	5.95
P51 37" A-B	7.95
Bat 32" C	4.95
Bug 17" A	2.95
Tiger Shark 36" C	4.95
Strata-Cat 36" B-C	5.95
Strata-Kitten 24" A-B	2.95
Super V Shark 24" B-C	4.95
Tarpon 28" B-C	10.75
P.D.Q. 24" A-B	5.00
Piper Skycycle 30" B-C	7.50
Falcon Speedster 25" B-C	5.45
Tether Streak 22" C	3.50
Dreamer 20" B-C	7.50
Von-Gee 18" B-C	10.00

Scale-Liners by Eagle:

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F6F4 Hellcat 42" B-C	4.95
P47N Thunderbolt 42" B-C	4.95
Trail Blazer 24" B-C	2.95
Bearcat 35 1/2" C	5.95
Navion 25 1/4" A	3.95
Competitor 26" C	5.50
Cyclone 36" B-C	4.95
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Whizzer DeLuxe 30" B-C	9.95
Falcon Sportster 25" B-C	5.45
Knight Twister 19" A-B	7.75
Baby V Shark 20" A-B	2.95
Miss Behave 34" B-C	3.95
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Tether Sharpie 18" A-B	2.00
G13 30" B-C	7.95
Cadet 33" A-B	5.45
Stardust 26" B	10.00
Atomic 14 1/2" B	3.50
Capital Navion 40" B-C	7.50
Presto-Liner 20" A-B	5.95
Beechcraft 40" B-C	8.95
Tyro 26" B-C	3.50
Flicker 24" A-B	3.95
Waco 34" B-C	8.50
Waco Deluxe 34" B-C	10.50

U-CONTROL ACCESSORIES

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140' Stainless Steel Wire	.75
Perrycraft Swivel Tank	2.50
Jem Control handle—pistol grip	2.95
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Metal Control Handles	1.25
Wood Control Reel 5 1/2" diam.	1.25
U-Control Horns	.15
U-Reely Deluxe Complete Control	7.50
U-Reely Remote	12.50
Sullivan Accessory Kit	1.25
Snafu Accessory Kit	1.00
Speed Indicator	.10
Stanzel Accessory Kit	1.00

FLOAT KITS

Typo 20 40" to 50" span planes	$1.00
30 up to 80" span planes	1.50
40 over 80" span planes	2.50

GAS BOOKS

Model Gas Engine Handbook	$1.00
Gas Modelers Guide	1.00
Gas Model Plane Construction	1.00
Control-Liners Bldg. & Flying	1.00
Model Airplane Design	3.75
Building & Flying Model Airplanes	2.00
Model Gas Engines	2.50
Model Aircraft Hand Book	2.50
Gas Models & Engines	3.00

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O-Gee (Built-up Hull)	10.95
Hardware for Sea Bird	2.95
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Single Struts 1 1/2"	.90
2"	1.00
Collars 1/8" or 3/16"	.25
Univ. Couplings 1/8" or 3/16"	1.25
Shafting 1/8", 1/8", 3/16", 1/4", 5/16", ft.	.25
Props: 2 Bladed: 2 1/2"	.50
3 1/2"	.60
3 Bladed: 3/4"	.45
1"	.45
1 1/4"	.50
1 1/2"	.60
2"	.60

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#6 Mat Knife (heavy)	1.50
#80 Whittlers Set	2.00
#40 Planer	1.00
#42 Sander	.50
#44 Saw	1.25
#48 Stripper	1.00
#1 Knife (light)	.50
#2 Knife (heavy)	.50
#1D Hand Drill (small)	.75
#2D Hand Drill (large)	.75
#62 (#1 & 2 & 12 Blades)	$2.00
#82 (#1, 2, 5 & 11 Blades)	3.50
#83 (#1, 2, 6 & 16 Blades)	5.00
#84 Hobbychest	7.50
#85 (#1, 2, 6, 44, 42, 48, 40, 1D, 2D, 8" ruler, 10 drills, & 23 assorted blades)	12.00

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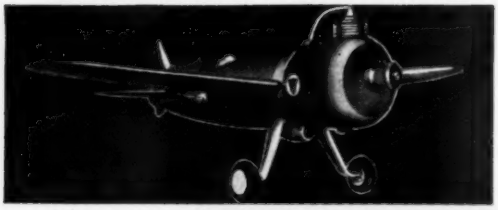

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"METEOR"
Wing Span 18"
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plus 15c by mail

(Right)
Frank Hawk's
"TIME FLIES"
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Each Kit Contains
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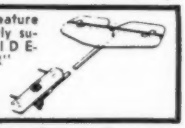

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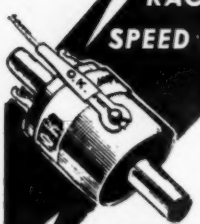

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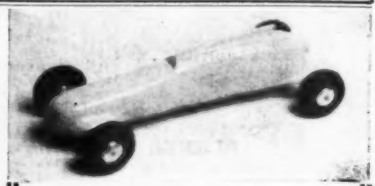

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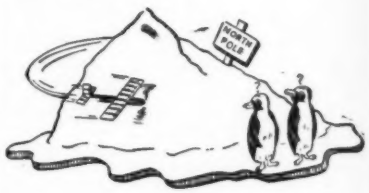
Model Airplane NEWSLETTER
by AL LEWIS

GENTLEMEN, hand out the towels, we have some sad news for you. We just heard from CPO Stan Stanwick with the Navy's "Operations Highjump" task force in the Antarctic and the word is not good. Stan was unsuccessful in flying a model over or in the vicinity of the South Pole.

Those who read our previous columns will recall that we've been waiting with bated breath to find out if indoor flyer Stanwick would be able to claim an Antarctic record of sorts. "No dice," says Stan. Just too darn cold. But he gave it the old college try so we can't say he shirked his duty.

Seems as if the extreme cold down there was just too much for the rubber motor on his ships. So even though we can't proclaim a new outdoor rubber record (for the Southern section of the globe, that is) at least we got a very valuable "cover" out of the deal. A cover, you know, is the specially marked envelope commemorating special occasions—this instance being the first mail delivery from the vicinity of the South Pole.



Navy man Stanwick says he is planning to attend the National meet. Did you know it is scheduled for Minneapolis and Monticello, Minn., August 18 through 22? That will give the north central states a break as far as model aviation publicity is concerned.

IN THE PAST National contests have been held in New York City, Detroit, Akron, St. Louis, Chicago, and Wichita. Sponsors this year are the Minnesota department (chapter) of the American Legion and the Legion's 40 & 8 club for Minnesota.

Bigger and better contests seem to be the pre-season plan this year. From the number of competitions already announced and those in the offing, it looks like a most active year. Ray Acord, AMA Vice Pres. for District X, reports that free flight activity is picking up out on the west coast. That is good news, indeed, since a better balanced gas model program (control line and free flight) means wider appeal to a greater number of potential enthusiasts . . .

SPEAKING OF new recruits, we were mighty glad to get a peek at a new club manual which is to be circulated by the American Legion to each of its more than 17,000 local posts. Idea behind the well-written and clearly presented manual is to get each post to sponsor at least one new model aero club. If only 10% of the posts take up aero-modeling at the start that means a possibility of 1700 new clubs. Wonderful!

The Legion booklet details, step by step, how a model club should be formed and operated. Cooperation and coordination with existing model groups is preached throughout so there should be a minimum of treading on toes . . .

WITH REGARDS to the "stepping on toes dept." you'll be much interested to know

that the new chairman of the Academy's contest board, Dr. Walter A. Good of Silver Spring, Md., has gotten his committee to agree that henceforth all changes in the contest regulations for a following year must be announced during the preceding November or no changes will be permitted for 12 months.

Three cheers, say we, for Doc Good and his rules-making gang. That's one of the best suggestions we've encountered in many a moon. We well remember one rule change—and an important one—which came just before a National meet, making ineligible a number of hot entries. Boy, did that raise a row! But now if the contest board hasn't made up its collective mind by November—then no changes for the following year.

INTERNATIONAL RELATIONS were further cemented recently when C. S. Rushbrooke, editor of the English "Aeromodeller" magazine, spent several weeks with Eastern model aero leaders. "Rushy" made many friends and gave everyone the impression that British modelers are a splendid lot. Let's hope he feels as highly of us.

Mr. Rushbrooke had a busy time during his stay. In addition to meeting most of the leaders in the New York area, he visited Washington, D.C. and AMA headquarters to discuss possibilities of holding the Wakefield meet this year.

Among Mr. R's new experiences were flying control line speed models, seeing some of the finest examples of microfilm indoor models, and meeting with the publishers and editors of model journals. We regret to say the English editor takes a very dim view of U-control race planes. He does feel that scale or stunt models might well be flown on the end of a line, but as for whirling 'round and 'round in a circle with a 100 mph-plus job on the end of the lines—well, observes Rushy, that just isn't for his boys over there.

Probably one thing that convinced him aerodynamics have little to do with supersonic control line speeds was Frank Ehling's half-wing, half-stab racing job which Mr. Rushbrooke saw in action. Quite a model. Features inboard wing, outboard stab. That's all, brother—no rudder, no other half wing, no other half stab. But it sure does get around the old circle!

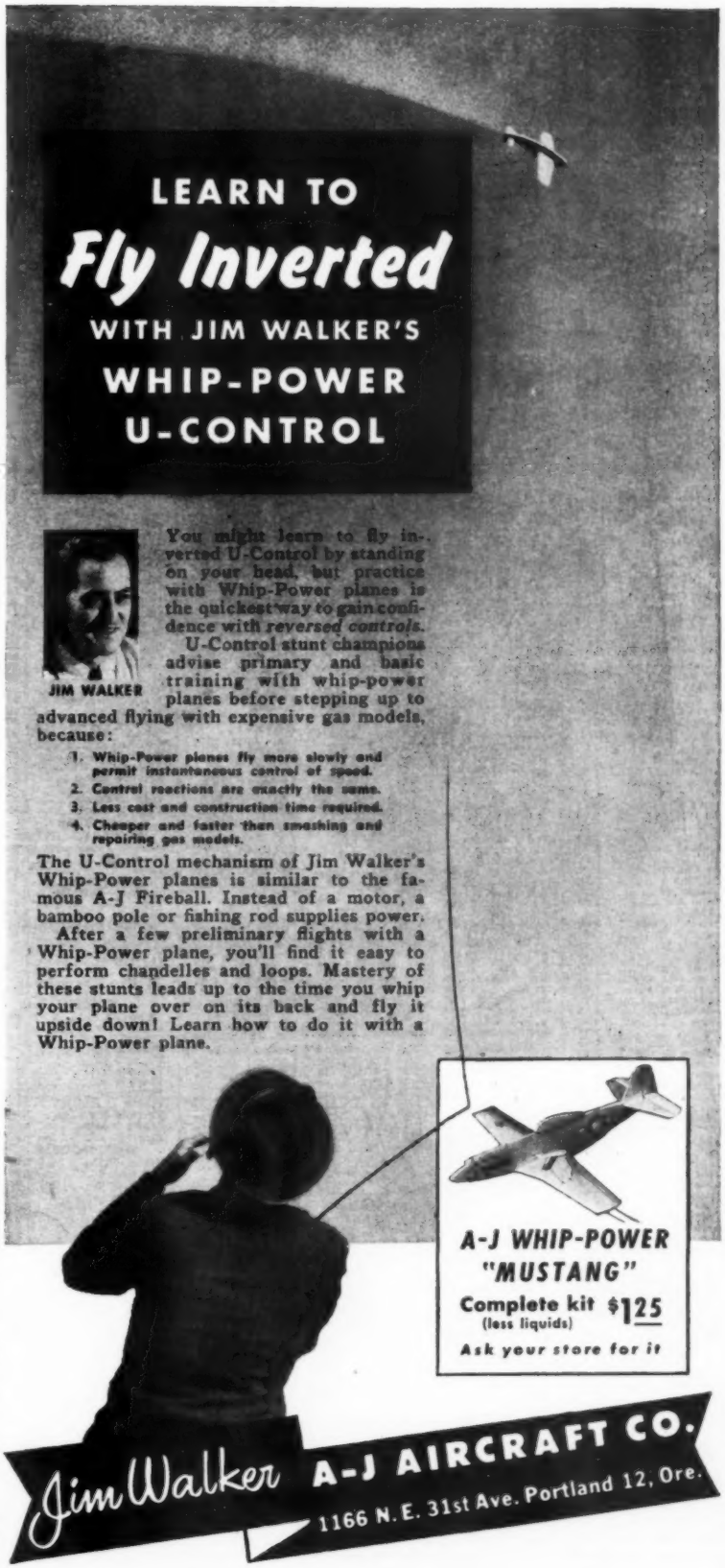
Merrick S. (Pete) Andrews introduced the British visitor to some of the finer phases of indoor modeling. Pete's built-up microfilm covered propellers are considered the finest in the country . . .

AS YOU MAY have heard, MODEL AIRPLANE NEWS publishes each month a trade "Newsletter" which is sent to dealers at no cost. Well, a recent issue of this "Newsletter" carried a most interesting item on the subject of professionalism. Here's the item:

DEALER CALLS FOR PROFESSIONAL CLASS

Twenty years in hobbies and most of them in the model business permits Tex Foster, Richmond Hill, N.Y., to speak with some degree of assurance. With more and more people in the (model-plane) industry, he sees a great injustice being done the customer when shop owners, employees, and those associated with manufacturing and distributing firms go out to meets to win prizes.

Speaking not only of model planes, but also of boats, race cars and archery (in



GMCO NOTES

VOLUME 2 NO. 7 JUNE 1947

GAS ENGINES FREE PROP. WITH EACH MOTOR

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*Arden .099 P. B.	$16.50
*Arden .099 B. B.	19.50
*Arden .199 B. B.	21.50
*Atom .099	15.50
*Bantam .199	18.50
Marvin .14	15.50
*Ohlsson 19	14.50

Class B

*Ohlsson 23	$16.50
*O.K. 29	15.50
Merlin 23	18.00
*De Long 30	19.50
*Cannon 300	19.75
*Bullet 100	15.00
Thor 30	9.95
Rogers 29	18.00
Meicraft 29	18.50
*Forster 29	19.50
*Torpedo 29	18.50

Class C

*Ohlsson 60	$18.50
*"OK" Raceway 60	22.00
*Vivell 35	18.00
*Ken 610	25.00
Dennymite 57	17.85
*Atwood Champion	23.50
*Wasp-Twin	44.50
Hornet 60	35.00
*McCoy 49	25.00
McCoy 60	35.00
*Madewell 49	18.00
*OK Super 60	18.00
*OK Twin	49.00
*Super Cyclone S.I.	22.65
*Super Cyclone D.I.	23.40
*Vivell 49	20.00
*Aero Mighty Midget	24.95
*Rocket 46	14.75
*Contestor RV	28.50
*Less coil and condenser	

DIESELS

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Drone B	21.50

JET

Dyna Jet	$24.50
Minijet	35.00

F.F. GAS KITS

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American Ace 36	1.50
Super A Skyrocket	2.95
Brigadier 39	1.95
Piper Cub Coupe	1.95
Baby Playboy	1.00
Zipper	1.95
Mike	2.00
Easterner	2.50
Runt	2.50
Aero Champ	1.00
Miss Tiny	3.25
Crusader 42	1.95
Ardent Air	2.00

CLASS B

Musketeer 54	3.50
Buccaneer 48	3.50
Brigadier 58	2.95
Buccaneer Spec.	3.95
Playboy Junior	2.50
Ripper	5.95
Jersey Javelin	3.95
Humdinger	3.95
Westerner B	4.50
Roamer	3.95
Pacer	3.95
Diamond Demon	2.00
Brooklyn Dodger	3.95
Powerhouse	4.95
Coronet	3.50
Sportaman	3.45
Airfoiler	3.95
Interceptor	3.98

CLASS C

New Buccaneer St'd	$5.95
Custom Cavalier 108	15.00
Piper Cub Super Cruiser	10.95
Flamingo Amphibian	9.95
Playboy Senior	4.50
Westerner C	5.95
Sailplane	6.95
Pacer	4.95
Spearhead Sr.	3.95
Mercury	5.50
Vagabond	9.50
Stinson Reliant	17.50
Super Sunduster	8.95
Buzzard Bombshell	9.95

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Packaged radio control ready for installation. $120.00.

NEW TIP BOOK!

Here is a NEW—a DIFFERENT hobby catalogue. It's full of time and money saving information for modellers—construction short cuts, tips on motor starting and maintenance, hints for contest flyers. It answers hundreds of questions hobbyists ask. In addition this catalogue contains all hobby items—model airplanes, ships, race cars, railroads, gas engines and all accessories, supplies and tools. Every month new sheets are sent you with latest models and materials . . . Send for this combination Hobby Tip Book and Catalogue RIGHT AWAY! It's only 25c and will save you $$$$$. CUT OUT THE COUPON AND MAIL IT—TODAY!

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Dia.	per ft.
1/16"	.10c
3/32"	.10c
1/8"	.10c
5/32"	.12c
3/16"	.12c
1/4"	.15c

Universal Needle Valve..75c

Flexible Needle Valve $1.00

Split Starter 4.00

U-Reely Control 7.50

Ferrycraft Tank 2.50

Froom Tanks 1.00

Alum. Prop Spinners, 13/16"20c; 1¼" 75c; 1½", 1.00; 2", 1.15; 2¼", 1.25; 2½", 1.50; 2¾ 1.75

Hi-Tension Lead ..... .15

Ignition Wire per ft. ..... .03

POWER PLUS WET CELLS

Free-Flite..$2.25
Super-Flite 2.95

Race Car Special 5.50
Booster 3.50

Aero lock lead ..... $ .25
B.B. Washers .10

Steel Music Wire, all sizes, 3 ft. lengths, Spark Plugs ea. ..... .50
Silkspan 00 ..... .05
Silkspan GM 3 for ..... .25

TREXLER AIR WHEELS

2" dia.	$ .50
2½" dia.	.60
2¾ " dia.	1.00
3" dia.	1.25
3½" dia.	1.50
4½" dia.	1.75
Aero Cond.	.35
Smith Cond.	.35

Minimum Wood order $1 Include 25c packing charge

BALSA "38" STRIPS

1/16 x 1/16 8 ..... .5c
1/16 x 1/8 6 ..... .5c
1/16 x 3/16 6 ..... .5c
1/16 x 1/4 ..... .1c
1/16 x 3/8 4 ..... .5c
1/16 x 1/2 ..... .2c
3/32 x 3/32 6 ..... .5c
3/32 x 3/16 ..... .1c
3/32 x 1/4 3 ..... .5c
3/32 x 3/8 ..... .2c
3/32x1/2 ..... .2 1/2c
1/8 x 1/8 6 ..... .5c
1/8 x 3/16 ..... .1c
1/8 x 1/4 3 ..... .5c
1/8 x 3/8 3 ..... .5c
1/8 x 1/2 ..... .2 1/2c
1/8 x 3/4 ..... .3 1/2c
1/8 x 1 ..... .6c
3/16x3/16 ..... .2c
3/16 x 1/4 ..... .2c
3/16 x 3/8 ..... .2 1/2c
3/16 x 1/2 ..... .3c
3/16 x 3/4 ..... .5c
3/16 x 1 ..... .7c
1/4 x 1/4 ..... .2 1/2c
1/4 x 3/8 ..... .4c
1/4 x 1/2 ..... .5c
1/4 x 3/4 ..... .7c
1/4 x 1 ..... .8c
5/16 x 5/16 ..... .8c
5/16 x 3/8 ..... .9c
5/16 x 1/2 ..... .8c
5/16 x 5/8 ..... .9c
5/16 x 1 ..... .12c
3/8 x 3/8 ..... .9c
3/8 x 1/2 ..... .10c
3/8 x 3/4 ..... .13c
1/2 x 1/2 ..... .10c
1/2 x 3/4 ..... .13c
1/2 x 1 ..... .14c
1/2 x 1 1/2 ..... .15c
5/8 x 1 ..... .18c

BALSA 36" PLANKS

1/32 x 2	.20c
3/64 x 2	.25c
2 x 2	.55c
1/32 x 3	.30c
3/32 x 2	.35c
2 x 3	.90c
3 x 3	1.40

BALSA 36" SHEETS

1/32 x 2	.7c
1/16 x 2	.8c
3/32 x 2	.9c
1/8 x 2	.11c
3/16 x 2	.13c
1/4 x 2	.14c
5/8 x 2	.17c

SPONGE WHEELS

(With Turned Alum. Hubs)

⅝" dia. ..25c pr.
1⅛" dia. .30c pr.
1⅜" dia. .35c pr.
1⅞" dia. .50c pr.
2⅜" dia. .60c pr.

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2½" dia., pr. $2.15
3½" dia., pr. 2.50
4½" dia., pr. 2.75

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Slide Switch..30c
Tip Jack ..... .12c
Pee Wee Clip..10c
Terminal clip, 2 ..... 5c
Alligator clip..10c
Solderless Plug ..... .12c
Lugs, 12 ..... 10c
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Elevator Hinges ..... .20c
Swivels, Class A, pr. ..... .15c
Swivels, Class B, C, pr. ..... .20c

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3/16 x 3/4	.6c
5/32 x 7/8	.7c
1/4 x 1	.8c

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Waco De Luxe	10.50
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which he specializes), Tex contends that these "professionals" are driving away less experienced and amateur contestants . . .

Tex proposes a "professional" class for all such contest-minded individuals with emphasis on prizes for the simon-pure amateur entrant. Not only that, but he feels that any modeler regardless of age, within the industry or out, should be classed as a "professional" the moment he or she accepts cash as a prize.

In general we agree with Mr. F., but we do take exception in the case of a club meet—let us say—where the top prize may be $5. Surely that doesn't put a winner in the same category as a chap who walks off with a $4000 airplane!

But there is a lot of serious thinking being given this super-experts, professional class. The *Sky Devils* of Westchester, N.Y., are about ready to come forth with specific recommendations. Perhaps you have some thoughts on the subject? If so, send them in to M.A.N. Editor McEntee or to this column . . .

SOMEBODY MADE a quick survey recently and came up with the startling statement that three-quarters of all gas kit sales today are for control models, only one-quarter are free flight jobs. Maybe so, but our guess is that warm weather will see a renewal of free flying.

Of course in the metropolitan areas it's getting harder and harder to find a place to fly, what with housing developments springing up everywhere. But we wouldn't "count out" free flight gas activity by any means.

On the other hand, a lot of diehards must admit that control flying is here for a good long stay—and it may outlast the heave-'em-and-hope-to-get-'em-back set, too. All you have to do is see genial Jim (U-control's pop) Walker flying two ships at once, each equipped with two-speed motor control. What the handsome brute (reminds us of Smilin' Jack!) can do with two models would make a fascinating subject for a movie short. Jim is so experienced he can put on a dog fight with the two ships, never letting his right hand know what his left hand is doing!

It's stuff like that there (!) which makes one realize control line flying opens up new pathways of progress, and it's about time the free flight fan realizes it. So let's have less carping back and forth between the two schools of thought. Let those who like line stuff concentrate on circular activity, and those whose hearts belong to the free flight jobs stick with the high-climbers and out-of-sighters.

Model aviation is producing a new type of ambidextrous flyer—the gas modeler who can perform creditably with both control line and free flight jobs. A real product of the Air Age!

Latest from A.M.A.

(*Continued from page 6*)

quired, the rules now permit other mechanical anti-whipping devices which are satisfactory in the judgment of the contest director. Because of the large number of anti-whipping devices which have appeared during recent months, and because many of these devices appear to be equal if not superior to the pivot disc, it was felt by the Board that the administration of the intent of the anti-whipping rule might well be left up to the discretion of contest directors. It is understood, of course, that any devices used will meet with the satisfaction of the contestants in each case.

A tabulation of the votes cast for each district by every member of the Contest Board in connection with the above questions has been prepared and a limited supply is available to AMA members. These may be obtained by writing directly to AMA Headquarters, 1025 Connecticut Ave., N. W., Washington 6, D. C.

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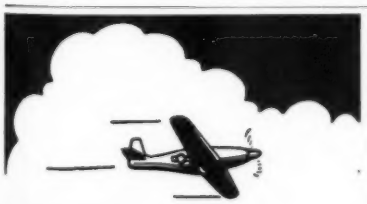

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WEST COAST TIPS

by JOHNNY DAVIS

WE are featuring photographs this month of the First All Speed Team (F.A.S.T.) with their trophies and the planes that won for them. Perhaps you will remember that last month we said these boys would be some of the ones to reckon with in the coming year. One look at the models should put the convincer on that statement.

On checking the record closely we find that among last year's contests in this area, there were 16 large sized affairs, of which F.A.S.T. managed to garner 50 prizes with 50 entrees. A breakdown shows that these boys received 13 first place trophies, 18 second place trophies, 11 third places, and divided the last 8 into 4 fourths and 4 fifths.

Once again we repeat that the only qualifications for admission to this new type of club are a desire to go *fast* and an airplane that can do it. Those interested should contact Jim Baker, 1117 W. Ramona, Alhambra, Calif. Phone Atlantic 18740.

* * *

ON THE EAST-WEST FRONT — The Glendale Exchange Club, Aviation Committee under the able direction of Dr. W. C. (Buzz) Darnell, has been working hard ironing out details of the elimination meet on the West Coast. All interested contestants are urged to contact the Exchange club in their area and inform them of their interest.

Following are excerpts from a letter recently circulated through the Exchange Clubs of California. The letter contained the rules of the meeting plus the additional arrangements for the eliminations:

ELIMINATION MEETS

"A. *Local.* Contestants from local areas may at the discretion of the committee be chosen either by elimination meets or, in case there are only one or two outstanding flyers and no others of championship caliber, they may be chosen by the votes of local flyers to represent the sponsoring club in the regional meets.

"B. *Regional Meets* (one in Los Angeles, one in San Francisco, one in San Diego) to be held under competition rules. Tentative dates May 17 and 18. *San Francisco*—that area north of a line drawn east and west 10 mi. north of Bakersfield. *Los Angeles*—that area included between two lines drawn east and west from (a) a point 10 mi. north of Bakersfield and (b) a point 1 mi. north of Oceanside. *San Diego*—the area south of a line east and west from a point 1 mi. north of Oceanside.

"C. *Final California Meet.* Tentative dates June 14, 15. Final elimination meet among 3 teams of 28 men, winners of the regional meets."

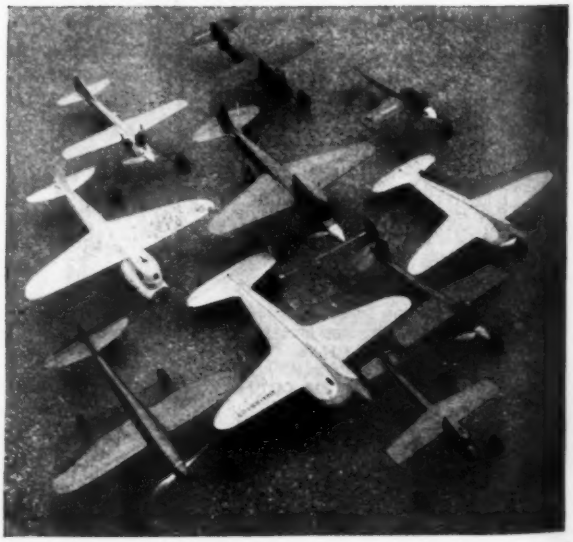
Regional meets as shown in the above excerpts are to be held in the three cities. The men in charge of each regional meet are:

A. San Francisco—Roy Mayes, 1204 Delaware, Berkeley, Calif.

B. Los Angeles—Dr. W. C. Darnell, 524

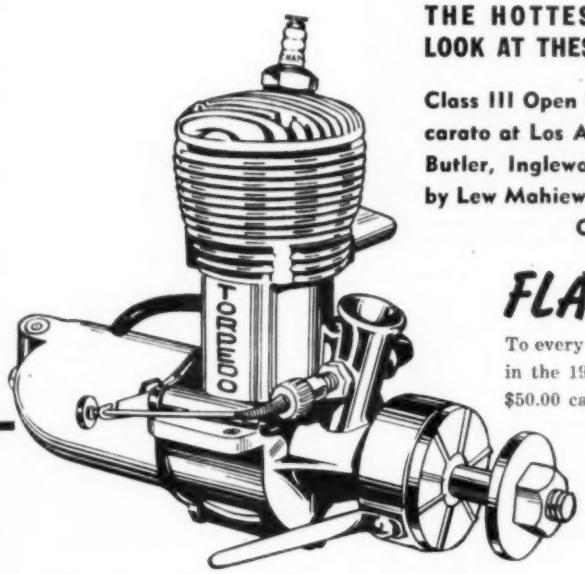
(*Turn to page* 14)

Members of the *First All-Speed Team* with trophies they have won. Left to right: J. Baker, L. Conrad, K. Conrad, N. Morgan, W. Carver, E. Miller, L. McBrayer, K. Storey



Planes used by members of F.A.S.T. Note the beautiful finish on these ships and the typical "Western Toothpick" propellers

K & B TORPEDO



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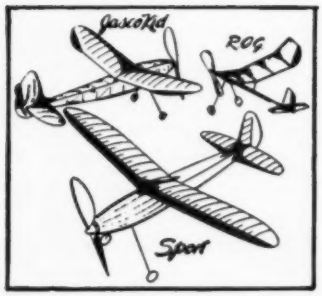

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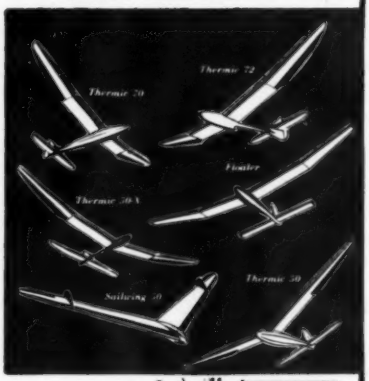

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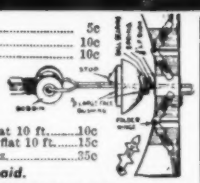

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More excerpts from the Exchange letter—

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"Team will be composed of first and second place winners in each of the 6 speed events and first place winners in the Junior and Senior precision events. In addition there will be selected an 'assistant' to each of the above. They will be selected on all around flying ability with particular stress on aptitude in team and stunt flying.

"Local clubs may send to the regional meets as many or as few contestants as they see fit, depending on the quality of the contestants.

"Standard entry blanks are being prepared and will be mailed to all participating clubs. They will require certification by an authorized member of the sponsoring Exchange Club. Entrants in the Junior division of the precision event may be required to furnish proof of age.

"Transportation to and from Chicago has been arranged for the participants. Expenses to regional and final meets and hotel and other expenses in Chicago, of successful contestants, will be the responsibility of the sponsoring Exchange Clubs. In addition, a distinctive uniform is planned for each representative that will not exceed $10 in cost.

"In your own club, in addition to the general chairman, will you also appoint a publicity chairman. I'm sure your local papers will cooperate to the fullest extent.

"The success of the Western team will rest largely in the hands of the local Exchange Club committees. Through them some hidden talent or unknown potential champ may be discovered. Needless to say, we're going to Chicago for one reason only, to give the Eastern flyers the thrashing of their lives. 'Beat the Bushes,' boys, you may have a world champ in your own back yard.

"We are hoping to make this one of the biggest things that has ever been done in Model Airplane activities. With your help I know we can do it.

"Dr. W. C. Darnell, *Chairman*."

• • •

THE Alhambra Control-line contest held in February was the season's opener in more ways than one. The contest was slow getting underway due to a last-minute revocation of the AMA sanction. The meet was advertised as an AMA sanctioned contest for two months in advance, therefore it seems reasonable that all adjustments should have been made in the two months previous to the contest regardless of who is at fault.

Results of this meet, sponsored by the Alhambra Chamber of Commerce are:

Precision—1. Don Gullota; 2. Don Fox; 3. Bill Vitale.

Jr. Precision—1. David Silver; 2. Tom J. Davey; 3. Glen Vandiver.

Speed Open A—1. Norm Morgan 101.98; 2. Ed Miller 93.07; 3. Les McBrayer 92.78.

Speed Open B—1. M. Crawford 109.09; 2. M. Axcell 106.19; 3. Don Miller 99.17.

Speed Open C—1. Joe Havlick Jr. 131.29; 2. Joe Kitchens 130.43; 3. T. Cramer 127.84.

Speed Jr. Class A—1. Geoff Burgan 71.62; 2. Bob Cannon 65.64.

Speed Jr. Class B—1. A. Wadleigh 101.86; 2. Bob Thomas 70.31.

Speed Jr. Class C—1. Ray Benskin 105.94; 2. Albert Wadleigh 102.85; 3. P. Hubert 95.74.

Flying Scale—1. Cedric Galloway; 2. Carter Moore; 3. Gerald Barton.

Ladies Event—1. Beverly Cosens.

Multi-Engined—1. T. A. Burris.

Jet, Diesel—1. Joe Mockall.

Unorthodox—1. Neal Harvey.

Team Stunt—J. C. Yates, Robt. L. Palmer, and Willard Hellman.

Entries: 250—55 in Open Class C Speed.

Precision Judges: Ray Vivian, Jack Kirby, Mel Anderson.

Speed Judges: Johnny Broadbeck, Lud Katee, Bill Sweet.

Announcer: Leighton C. Conrad.

Contest Director: Ace Boultinghouse.

Flash News

(*Continued from page 2*)

loads. A huge bubble canopy will be used in the nose with revised bombardier-nose gunner enclosure. The XB-36 recently broke a record by taking off at a gross weight of 278,000 lbs., greatest load ever lifted into the air. The giant bomber stayed aloft 5 hours for "maximum gross" tests. The XC-99, cargo sister-ship of XB-36, is nearing completion with final assembly scheduled to take place outdoors at CV San Diego plant due to its huge size. The Consolidated Vultee XP-81 project has been cancelled by the AAF.

NEW TRANSPORTS, just publicity drawings and promises a year ago, are now taking shape. Three Martin 202's are now flying and the first delivery is scheduled shortly. The twin engine transport is designed to replace the historic Douglas DC-3. First production Boeing *Stratofreighter* has completed its test flight. It is a YC-97 for AAF and features a change to nylon bladder-type fuel cells, saving 719 lbs. in weight yet carrying 75 gals. more fuel. Eight Consolidated Vultee 240's are on production line with the first ready for flight test. Orders for over 150 are on the books, many to foreign airlines.

THE FIRST Fairchild cross-wind landing gear trainer has been accepted by Civil Aeronautics Administration and flight tests are under way by Lloyd Child, famous Curtiss Wright test pilot and now Assistant Administrator of CA for personal flying development under his old boss T. P. Wright, former Curtiss Chief Engineer. Purpose of the test is to develop performance data and technical information to be furnished the lightplane industry for use on similar designs. Firestone Tire and Rubber Co. is developing another design on an *Ercoupe*, and Goodyear has an additional contract for developing a cross-wind landing gear for use on a high wing monoplane.

AAF awarded a contract to Lockheed for P-80B *Shooting Star* jet propelled fighters. The revised versions include a thinner wing, modified air intake and wing root section, and armament changes. These changes have been tested in service on the special P-80R racing model flown at Muroc under careful wraps. The return of warm weather will see new attempts by the P-80R to break the world landplane speed record of 616 mph.

RUMOR HAS IT that the new Grumman XF9F-1 jet fighter will be powered by a British Rolls-Royce *Nene* engine. The Navy has been runing tests on both the *Nene* and *Derwent* engines.

ALLISON Division of General Motors Corp. is now manufacturing the General Electric I-40 (J-33) and TG-180 (J-35) turbojet engines for AAF. Design and engineering work continues at G.E. on new types with Allison doing engineering modifications and improvements to the production types. G.E. has announced a new research laboratory for jet engines to cost $500,000.

CURTISS-WRIGHT Corp., oldest aircraft company in the business, has signed a contract to overhaul 74 Douglas R4D transports for the Navy at cost of $3,500,000. In addition, Curtiss is building 5000 Navy standard Mark XII fuel tanks and droppable fuel tanks, the latter for AAF P-80 *Shooting Star* fighters.

ELECTRIC BOAT Co. of New York has entered the aviation business! It was recently awarded complete production contracts for the *North Star* transport by Canadian government. The *North Star* is a Douglas DC-4 powered by four Rolls-Royce *Merlin* liquid cooled engines. The planes will be built for Trans-Canada Airlines and Royal Canadian Air Force.

(*Turn to page 87*)

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Built with the same skill that produced the famous Orwick "64," this is one of the hottest little engines for its class that we've seen. Not a mass-production engine; but built with true craftsmanship for those who want the best. Send for yours now..... $24.95

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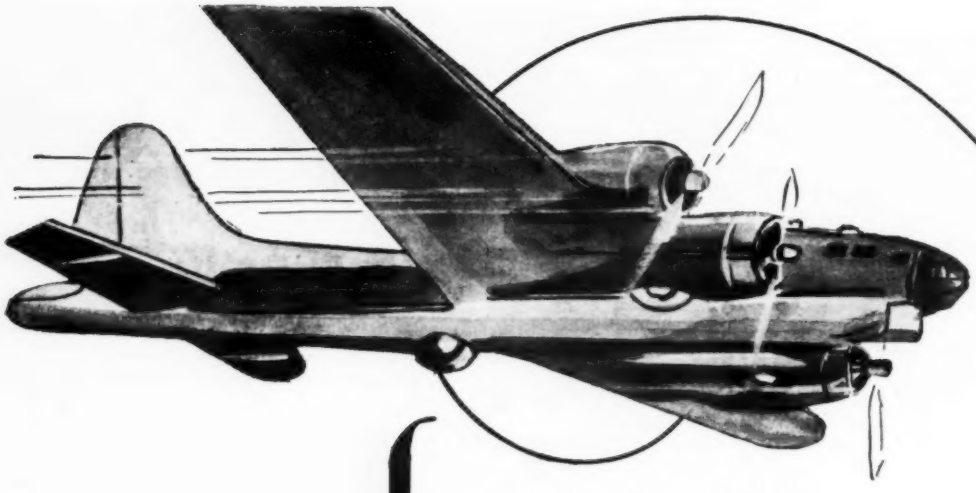

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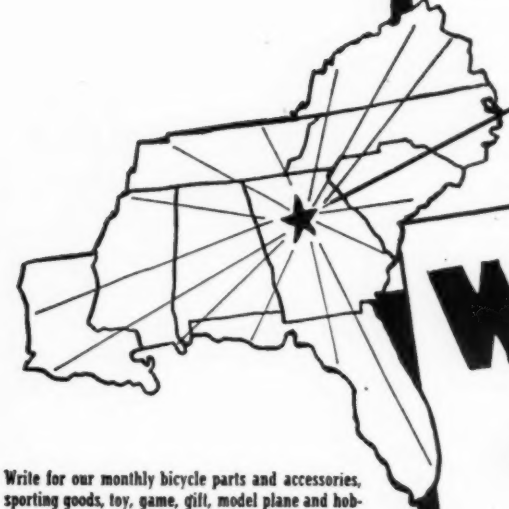

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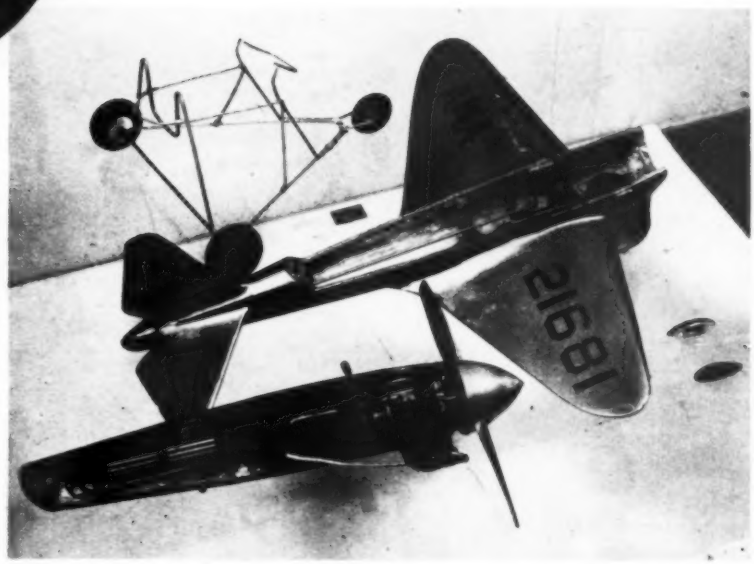
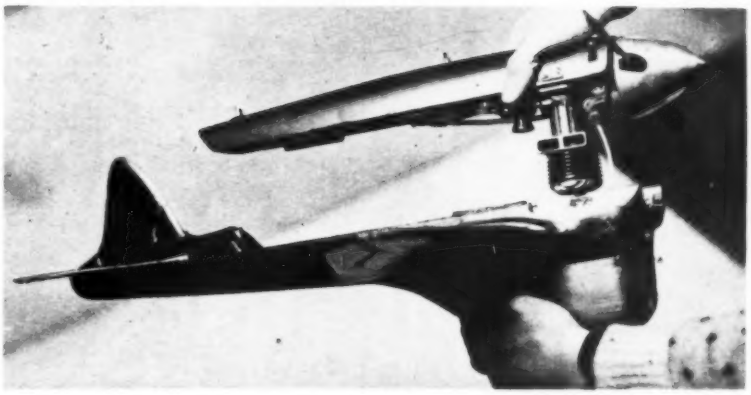
ATLANTA 1, GEORGIA

SCORPION II

by J. S. LUCK





THE high speed control line model's design is now well beyond that stage in its development where a single ship could be flown satisfactorily enough to meet average competition, no matter what engine of a particular class powered it. Those days are gone forever and powerplants must now be defined within much narrower limits.

A ship may be designed to fly at optimum efficiency with, for instance, either a *Hornet* or a *McCoy;* or else a *Super Cyclone* and a *Super Champion.* Displacement notwithstanding, the latter two are not in the same class as the former, even though all four are exceptionally fine engines. In the matter of wing area alone, the model designed for a *Hornet* would be unable to develop sufficient lift at the speed a *Cyke* is capable of; and conversely something like 5% of the wing area of a ship designed for the *Champ* may be clipped if the powerplant is to be a *McCoy* instead—all up weight being equal.

The writer and his associates, realizing the necessity for closer design relationship between the model and its particular engine, set about the task of designing a series of five high-efficiency speed models which fell roughly in the A, B and C displacement classes. The *Scamp* was designed for any motor of .19 cu. inch displacement; the *Scarab* for standard .23 to .29 motors; the *Scalpel* for the hot "30's"; the *Scorpion* for standard "60's"; and lastly, a model still in the experimental stage, the *Scimitar* intended for the super hot powerplants of AMA Class VI rating.

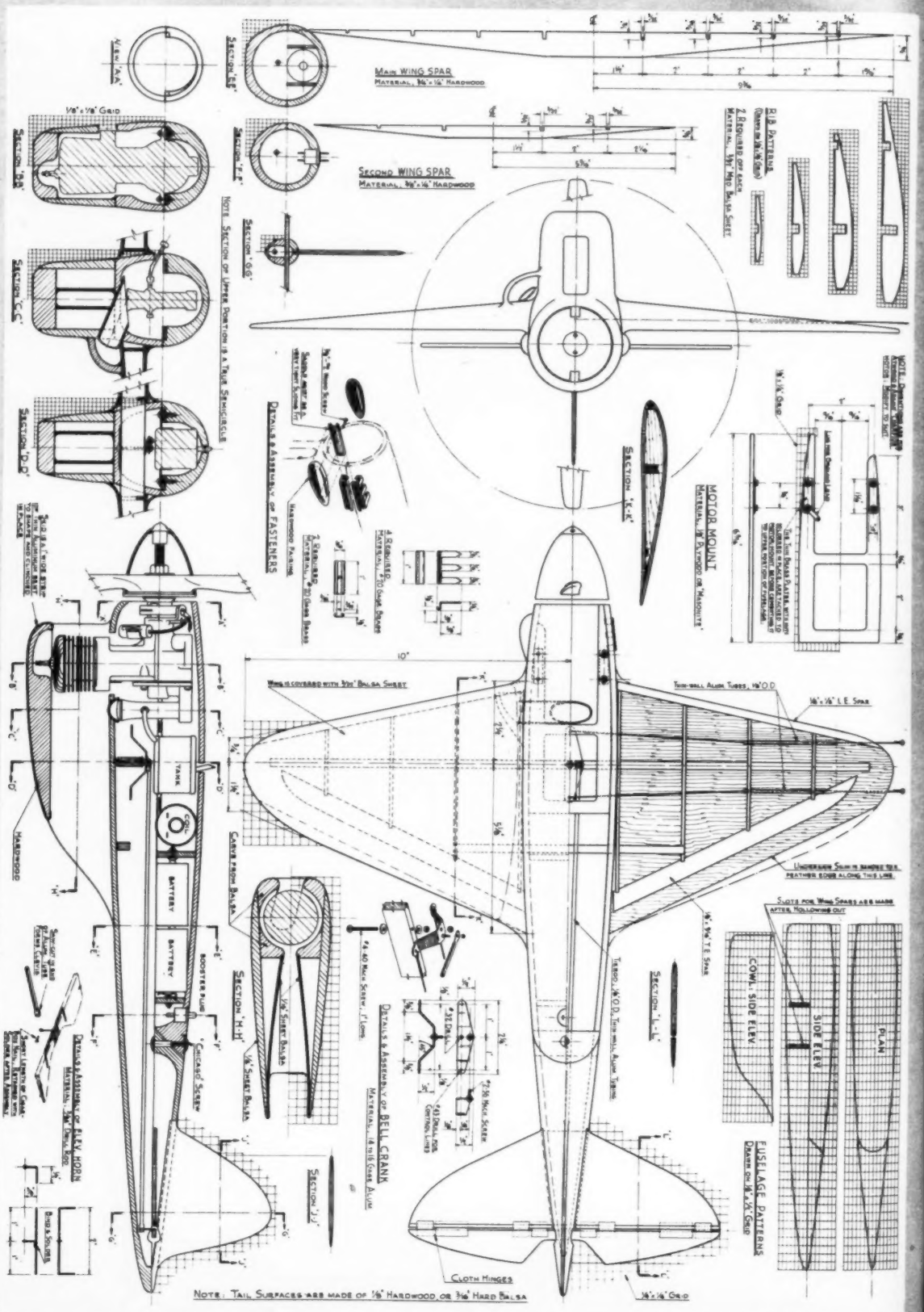
The *Scorpion* was elected for publication because the majority of readers seem to favor the larger motors. However, if there is sufficient demand for the whining winged bullets of smaller caliber, the *Scamp, Scalpel,* or *Scarab* may yet appear in these pages.

A glance at the plans and it will be quite apparent that the *Scorpion* was *engineered,* in the true sense of the word, around Bill Atwood's famous engine; but this does not preclude installation of other powerplants of comparable size and efficiency. Few changes are required before installing any standard "sixty." Just as it would be impossible to build a precision watch from freehand sketches, so also would it hardly be expected that the drawing for an advanced control liner could be prepared without resorting to some advanced mechanical drafting practice. A proper understanding of the plans will, therefore, entail an elementary knowledge of blueprint reading; and some of the younger readers may have to call for a little assistance from their more experienced pals. The drawings are quite complete; so construction notes, rather than a detailed construction-procedure-for-the-amateur, will accompany it. After all, it is hoped that this is not going to be the reader's first attempt at aeromodeling—that would be very ill-advised indeed. This is definitely a job for those of us whose hair is oft turned white with balsa dust; whose nicked and battered fingers, with their dope-smeared oilsoaked nails, have long since become such an accepted part of our personal appearance, that to be without them would seem unnatural and effete.

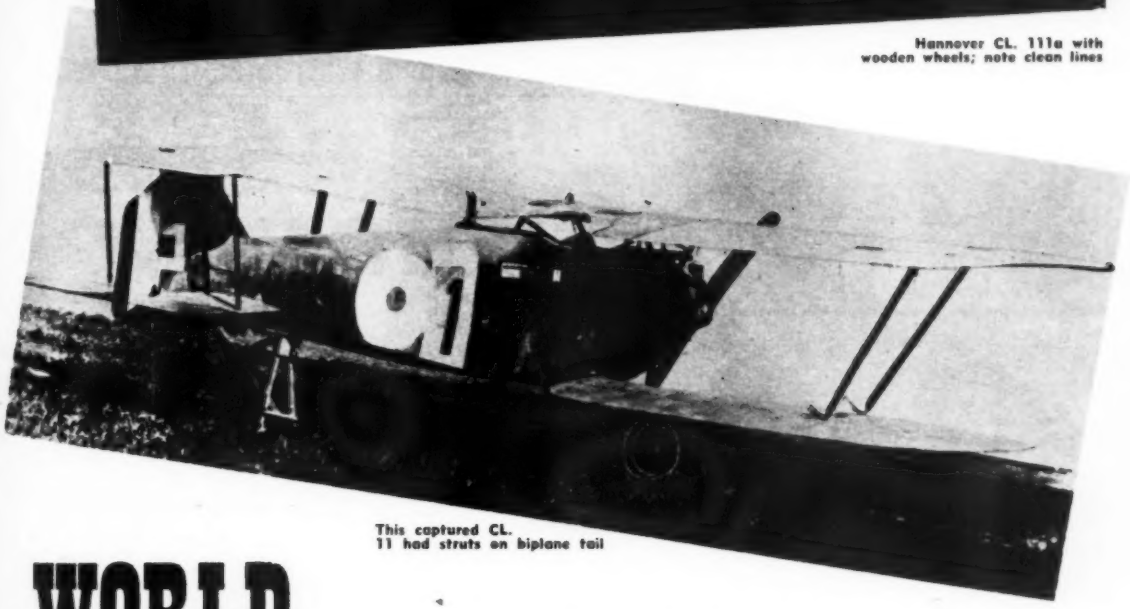
Construction Notes

1. Both halves of the fuselage may be cut out of a single 36" length of 2" x 4" medium hard, straight grained balsa. Make the 45° cut just back of section

(*Turn to page* 63)


MAIN WING SPAR
MATERIAL, 3/16" x 1/2" HARDWOOD
SECOND WING SPAR
MATERIAL, 3/16" x 1/2" HARDWOOD
RIB PATTERNS
2 REQUIRED OFF EACH
MATERIAL, 1/32" MED BALSA SHEET
MOTOR MOUNT
MATERIAL, 1/4" PLYWOOD OR "MASONITE"
WING IS COVERED WITH 1/20" BALSA SHEET
TUBING, 1/16" O.D.
1/16" x 1/16" L.E. SPAR
1/16" x 1/16" T.E. SPAR
SECTION "A-A"
SECTION "B-B"
SECTION "C-C"
SECTION "D-D"
SECTION "E-E"
SECTION "F-F"
SECTION "G-G"
SECTION "H-H"
SECTION "I-I"
SECTION "J-J"
SECTION "K-K"
SECTION "L-L"
1/16" x 1/16" GRID
NOTE: SECTION OF UPPER PORTION IS A TRUE SEMICIRCLE
DETAILS & ASSEMBLY OF FASTENERS
DETAILS & ASSEMBLY OF BELL CRANK
MATERIAL, 14 GA SHEET ALUM
DETAILS & ASSEMBLY OF RUDDER HORN
MATERIAL, 1/16" CHERRY WOOD
FUSELAGE PATTERNS
DRAWN ON 1/4" x 1/4" GRID
COWL: SIDE ELEV.
SIDE ELEV.
PLAN
TANK
BATTERY
BATTERY
BOOSTER PLUG
"CHICAGO" SCREW
HARDWOOD
CARVE FROM BALSA
1/16" SHEET BALSA
1/16" SHEET BALSA
CLOTH HINGES
NOTE: TAIL SURFACES ARE MADE OF 1/16" HARDWOOD OR 3/16" HARD BALSA

Hannover CL. 111a with wooden wheels; note clean lines



This captured CL. 11 had struts on biplane tail

WORLD WAR I

by ROBERT C. HARE

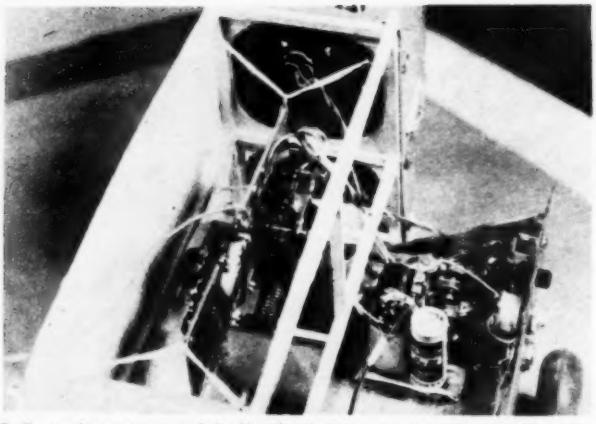
BY the middle of 1917 aircraft used in military operations had been pretty well resolved down to three basic types: the single seat fighter, the two seat observation plane, and the twin engine bomber. On occasion, observation types were equipped with bombs for daylight operations and some models were actually redesigned for this work. But out of it all came the general feeling on both sides that a two seater must have fighter protection, and a two seater caught alone without fighter protection was a piece of "cold meat".

While some two seaters could put up a good fight against a pursuit plane, they were generally bested by virtue of their greater weight per horsepower and resulting poorer performance, in spite of the fact that the second occupant was armed with a flexible machine gun and theoretically, plane for plane, outgunned the pursuits. Theory or not, it was generally the lone two seater that lost.

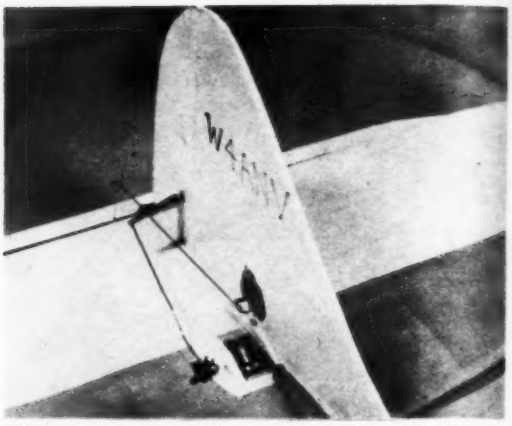
Anticipating the need for a better performing two seater, the German Flugzeugmeisterei (air ministry) sent out specifications in the spring of 1917 for a new type that was neither fish nor fowl but combined a little of both observer and fighter in its makeup. The idea was to provide eagles of the Black Cross with a ship that could carry out most "C" class observation plane duties with enough zip left over to make it self-defending. The new type was designated "CL"—lighter, smaller and less powerful than standard "C" types. Specifications called for an engine of 160 to 180 hp, a crew weight of 160 kgs., one fixed synchronized and one flexible machine gun, no bombs but provisions for both radio and photographic apparatus. Fuel for three hours' flight was not to exceed 110 kgs. in weight, and the total disposable load was not to exceed 360 kgs. In broad engineering terms German designers translated these specifications into a light weight, two seat, self-defending observation craft that was practically bare of non-essentials.

First of the type to meet the new specifications was produced by Hannoversche Waggonfabrik A. G. located at Hannover-Linden, an old line carriage manufacturing concern that had been drafted into the aircraft business in November 1915 by government edict. For two years Han-

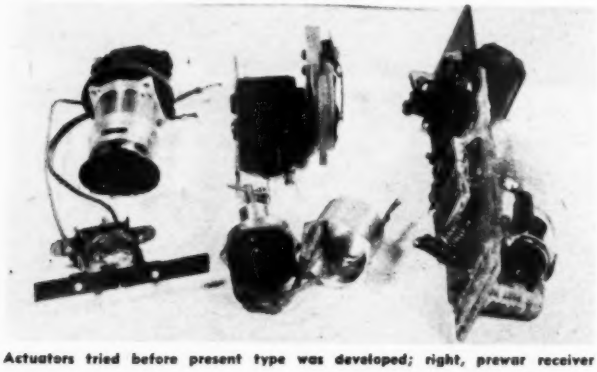
(*Turn to page 50*)



Radio equipment mounted in *Vagabond;* lower section pulls out like tray

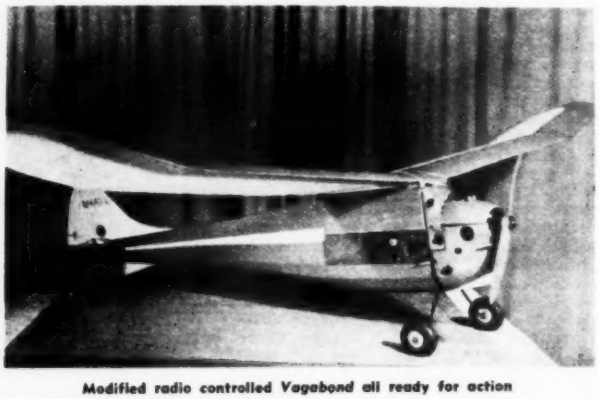


Actuators are small enough to mount right on tail surfaces



Actuators tried before present type was developed; right, prewar receiver

Single ground control at left; unit at right varies pulse length and rate



Modified radio controlled *Vagabond* all ready for action

PULSE RATE CONTROL

At last! A simple radio system that allows accurate "stick" control

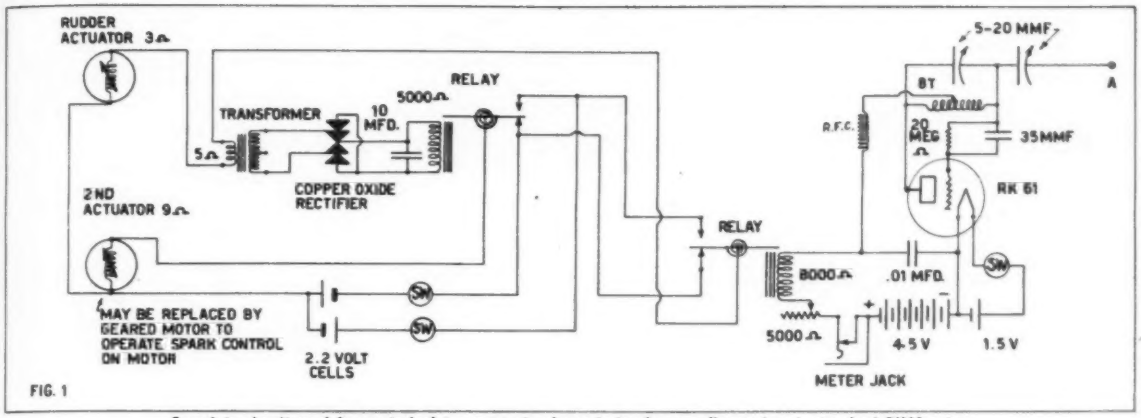
by GEORGE G. TRAMMELL

WHILE seeking a simple and accurate control system for model use many arrangements, both well known and otherwise, were tried out. Since the escapement method is the most widely used and the simplest, this was investigated first.

Did you ever try to fly an airplane by moving the controls suddenly rather than smoothly. I'll bet not many people have, because this is the first thing the instructor tells you *not* to do. I tried it to determine how accurately an escapement-controlled model could be flown—it was not so good. The lighter the wing loading the more sudden the change of direction would be; therefore the model would travel in a series of jumps.

The next thing tried was to fly as if by "Blip Control" (that is what the Army calls it). The controls are moved slowly, one at a time to the positions you think necessary for a particular maneuver. This is smooth enough, but it is impossible to control very accurately or quickly. This system is used in the Army RC target planes with audio channels to select the different controls. It requires a great deal of practice to become proficient in handling a plane with this method because only one control can be operated at a time using audio channel selectors.

The smallest Army RC plane I know of, which was landed by remote control in practice, was a regular two place *Culver* modified for the purpose. The landing gear was changed to a tricycle type and the nose wheel was connected to the rudder. An automatic pilot (AP) was installed which was operated by radio: the AP then controlled the plane. The throttle and brakes were operated from one control. After the throttle closes, if the control is held on the brakes are gradually applied. (This is a trick worth remembering for model purposes.) Eight audio channels are



Complete circuit used for control of two separate elements to plane; radio receiver is standard RK61 setup.

used and the filter and relay unit alone contains 9 double tubes and weighs 20 lbs. The receiver is a super-heterodyne, crystal stabilized.

The system of audio channel control doubtless has many virtues as it is used almost universally for target drones, and many RC model builders express hopes of using it. The lightest successful unit the writer has yet been able to make weighs over 1/2 lb. per channel. The possibilities are not of course limited to this much weight. Higher frequencies, such as 50,000 to 100,000 cycles, would enable us to employ air-core coils of relatively small size. It is quite possible that weight may be reduced to 4 oz. or slightly less per channel. Each relay and channel filter will require a tube, which uses up more battery. Hence it doesn't look too hopeful for lightweight models.

About this time a simplified scheme was worked out which I have found to fill the bill completely. Wouldn't you like to have a control system wherein the controlled surface on the plane followed exactly the position of the control in your hand, operating just the way the controls in the full sized plane do? When you pull the wheel (or stick) back 10% you get 10% up flipper. You can immediately advance or lessen the control at will. And, too, all controls may be operated simultaneously. Well, fellows, here it is—and it is even lighter than any other system we have seen.

For want of a better name the system described was termed "pulsed control." The pulses are varied in duration to operate one element, while another element may be two-position, or on-and-off, controlled by the frequency of the pulses. These two variations of the pulses have no effect whatever on each other (unless the pulse duration control were in its extreme position of all signal or no signal). Most everyone has heard of pulse transmission in connection with radar; it simply means short bursts of transmission followed by periods of no signal. In other words, the transmitter is rapidly turned on and off.

We can use any radio control transmitter and receiver we choose. The very simplest that will operate a relay in the plane is quite satisfactory. There have been many of these fully described in past issues so we will not go into detail on this.

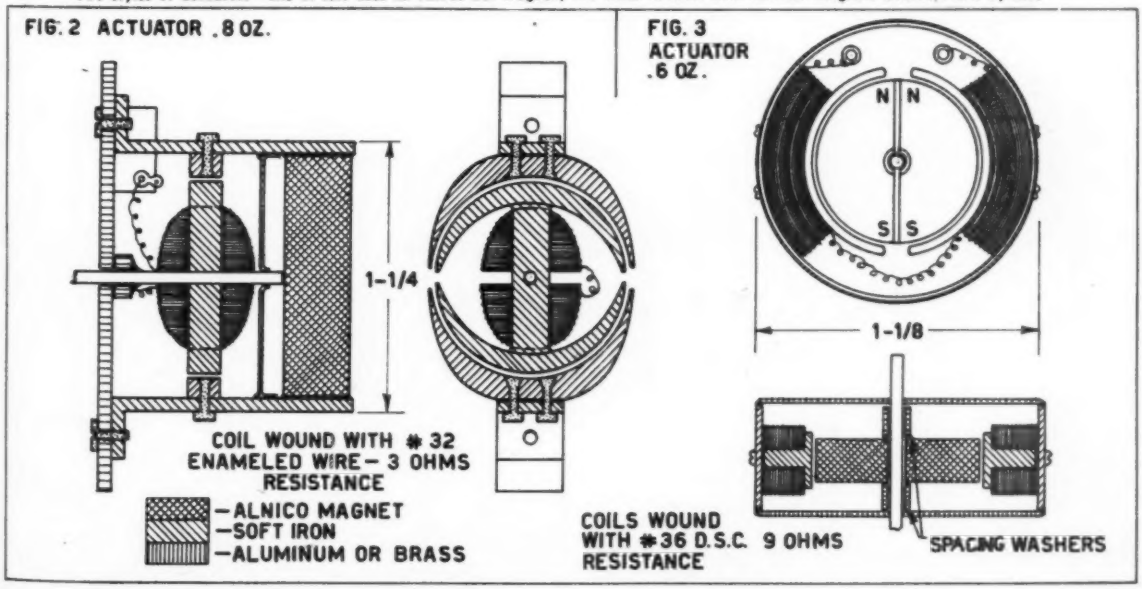
Here is the way the pulsed control evolved from the more usual motor driven control. If signal-on gave us right rudder and signal-off gave us left, we could fly a nice zigzag pattern, controlling with a key or switch. So we put an electric motor in the plane, controlled by the relay of the radio receiver. Signal-on runs the motor one way turning the rudder toward the right; signal-off reverses the motor and we go left. If the signal is turned on and off rapidly, with the on and off periods the same, the motor should practically stand still; it will if the pulsing is rapid enough. With a fairly slow pulse rate—say 2 per second—the rudder will wiggle a little, but this is of no great consequence as it moves just as far to one side as to the other. The flight path of the model is not affected, and the rudder can now be made to remain in any position.

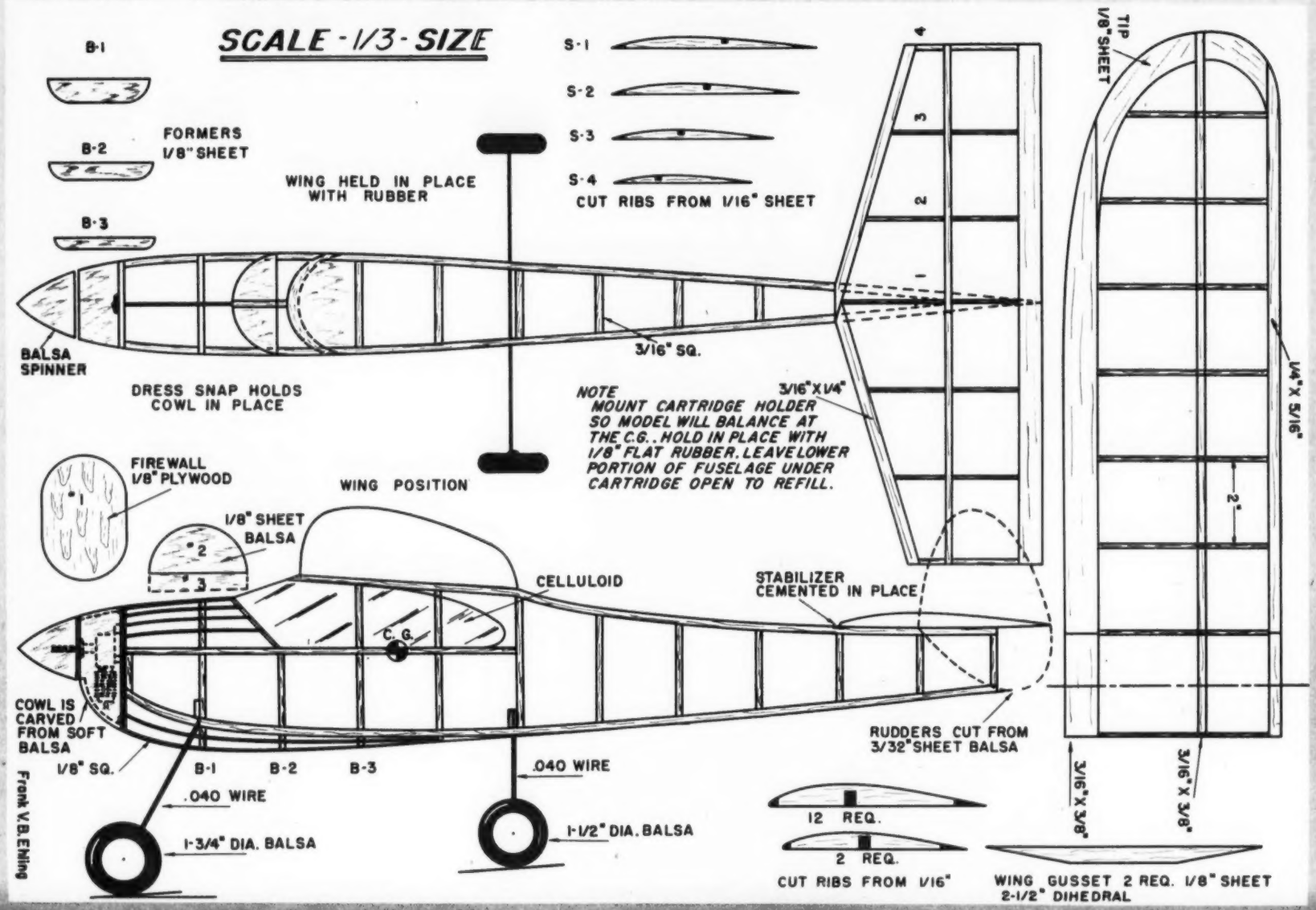
The ground control must have some automatic means of pulsing the signal. The writer used an old electric windshield wiper for the first model. The shaft that carried the wiper blade oscillates back and forth through nearly 180 degrees several times a second; this worked out fine.

The end of the shaft that protrudes was

(*Turn to page* 73)

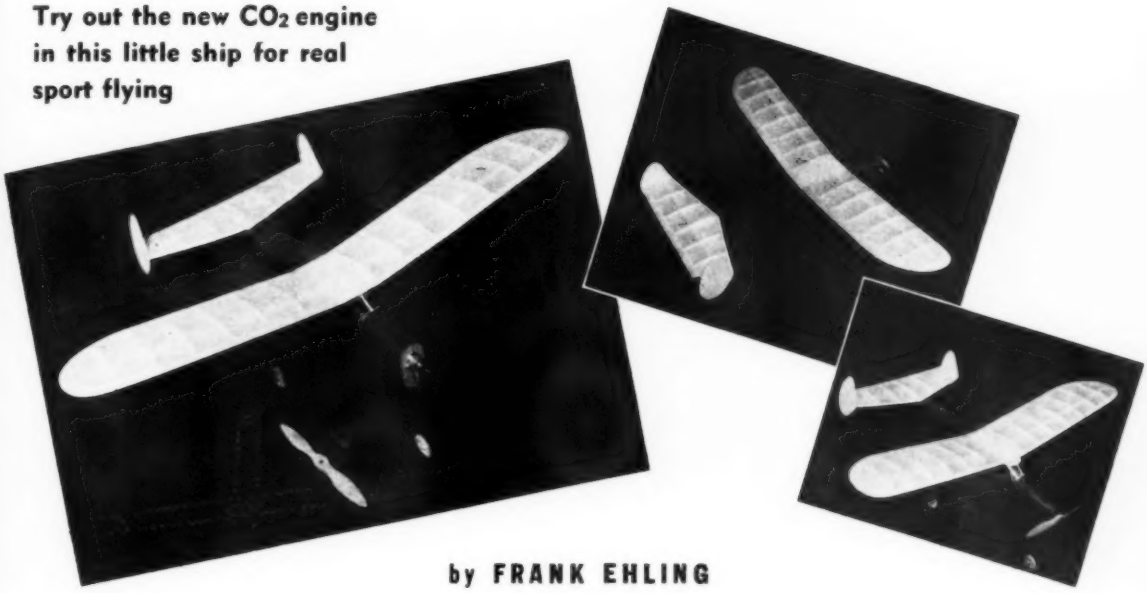
Two styles of actuators—one at left uses an Alnico bar magnet; the other is built with two bar magnets soldered side by side




SCALE - 1/3 - SIZE
B-1
B-2
B-3
FORMERS 1/8" SHEET
WING HELD IN PLACE WITH RUBBER
S-1
S-2
S-3
S-4
CUT RIBS FROM 1/16" SHEET
TIP 1/8" SHEET
BALSA SPINNER
DRESS SNAP HOLDS COWL IN PLACE
3/16" SQ.
NOTE
MOUNT CARTRIDGE HOLDER SO MODEL WILL BALANCE AT THE C.G. HOLD IN PLACE WITH 1/8" FLAT RUBBER. LEAVE LOWER PORTION OF FUSELAGE UNDER CARTRIDGE OPEN TO REFILL.
3/16" X 1/4"
1/4" X 5/16"
2"
FIREWALL 1/8" PLYWOOD
WING POSITION
1/8" SHEET BALSA
CELLULOID
STABILIZER CEMENTED IN PLACE
C. G.
COWL IS CARVED FROM SOFT BALSA
1/8" SQ.
B-1
B-2
B-3
.040 WIRE
1-3/4" DIA. BALSA
.040 WIRE
1-1/2" DIA. BALSA
RUDDERS CUT FROM 3/32" SHEET BALSA
12 REQ.
2 REQ.
CUT RIBS FROM 1/16"
3/16" X 3/8"
3/16" X 3/8"
WING GUSSET 2 REQ. 1/8" SHEET
2-1/2" DIHEDRAL
Front V.B. Ehling

IN-B-TWEEN

Try out the new CO_2 engine in this little ship for real sport flying



by **FRANK EHLING**

MODELERS who in the past have had little luck with rubber powered models, and even less with gas jobs, should give this little ship a chance—for here we have the true *in-between*. The makers of the new CO_2 engine have given the modeler a chance to get started again; he can later turn to rubber or powered models, as this design can also be flown with rubber or a small diesel engine. While a compressed air engine is not a new idea, the CO_2 powerplant is a far cry from what the modeler had to work with back in the early thirties.

Let's get started on the ship—so clear off that table top and start the plan which will have to be enlarged to three times the size shown. Lay the sides down one atop the other; while these are drying the formers can be cut out. When the sides are dry remove from the plan and cement the crossbraces in place followed by the formers and stringers. Bend the landing gear to shape and cement in place as shown on the plan. The so-called firewall is now fastened in place and the engine bolted on, slipping the cartridge holder in the fuselage to be located later—do not fasten it yet.

Draw the wing plan to size, cut the ribs and wingtips and assemble over the plan. The two halves are cemented together with gussets added to strengthen the joint. Be sure to cement all the joints well as the covering will twist the wing out of shape if the wing is not strong. The wing is sanded and if any cement joints are weakened, re-cement; then cover the wing with Silkspan.

The stabilizer is made in the same manner as the wing. Be sure to double up the stabilizer tips with an extra rib so that the covering will not pull in the end rib when the covering tightens.

The rudders are cut out and sanded to a streamline shape after which they should be doped and cemented in place.

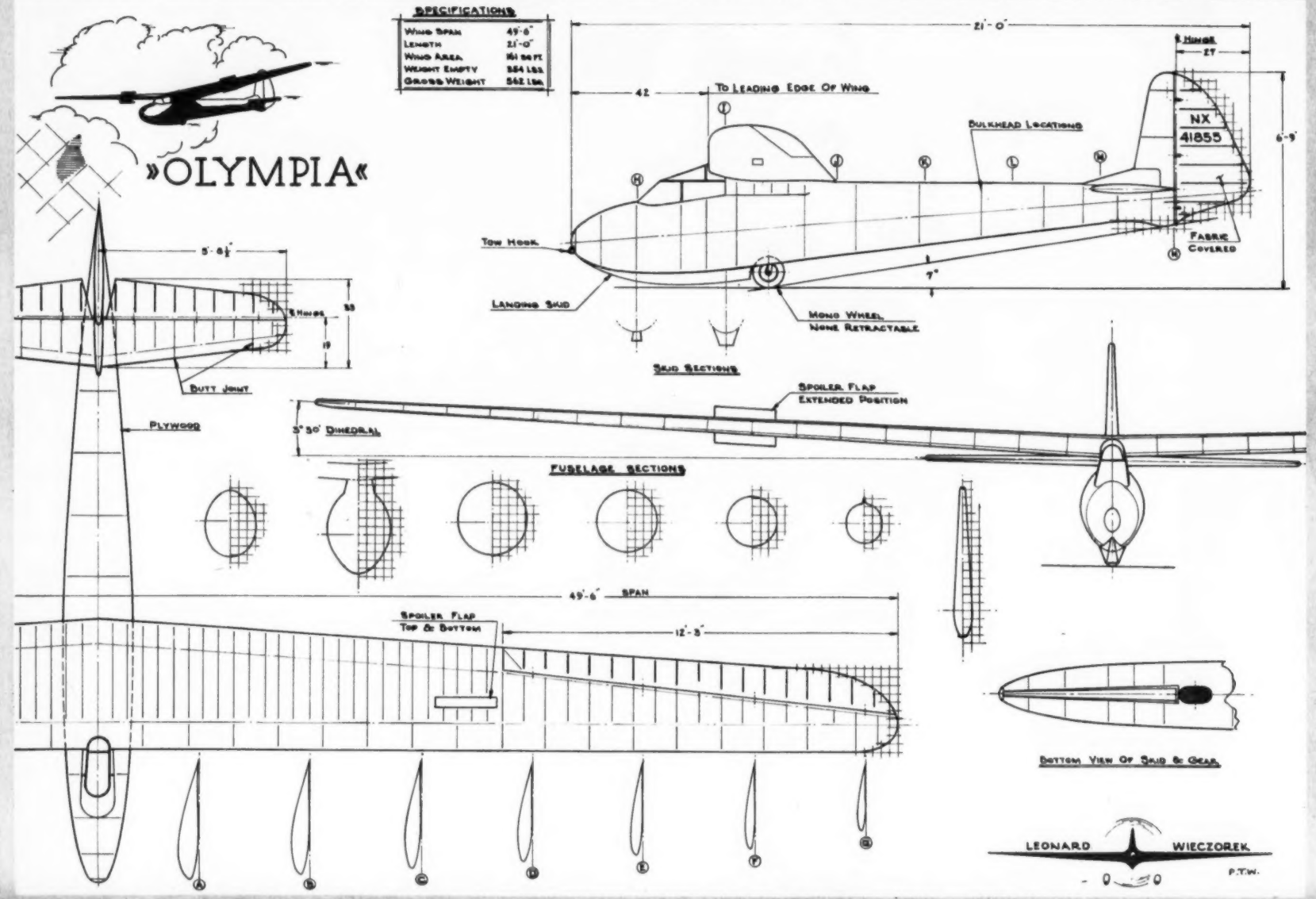
When the ship is completely covered the wing is strapped in place with rubber. Glides are then tried, and the model is balanced by moving the cartridge holder back and forth until you obtain a good smooth glide. Tests on the original ship showed that the same adjustment will give perfect power flights; also that no down thrust or side thrust of the motor is needed. The holder is then tied with rubberbands so it can be slipped out of the lower hatch to be refilled. Be sure to have a filled cartridge in the holder while this balancing is being undertaken.

Complete instructions for operating the powerplant are packed with the motor so we will not repeat them here. There is one tip we have found, however, that may be helpful: check to see that the edge of the CO_2 cartridge seal is smooth before inserting it in the holder. If it isn't, leakage will result and there will be loss of power. We found some cartridges had a tiny lip of rubber projecting up at the edge of the seal. This rubber was trimmed off flush with a razor blade.

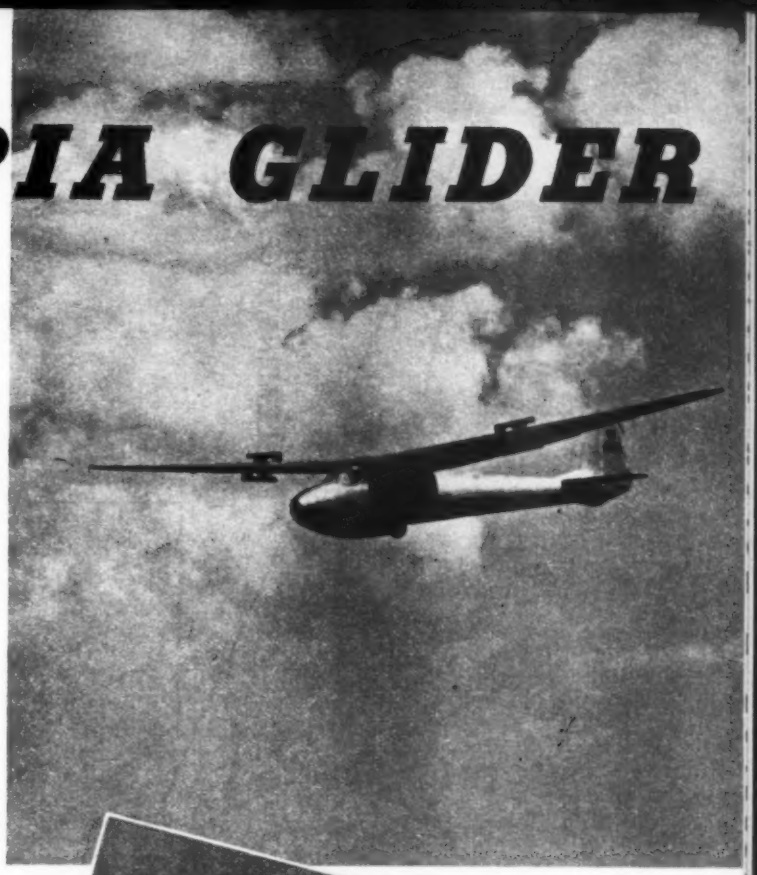
We used the prop that was shown on the instruction sheet, carving it from hard balsa. This propeller was found to be perfectly satisfactory, and since it is 8" dia. and 3" pitch it gave snappy performance with a good climb.

After a collision with a building during test flights had broken the original prop, several commercial types were tried. An 8" prop with 4" pitch gave almost the same performance as the original 8-3. An 8-6 gave quite a bit longer motor run (30 sec. total) but of course a much slower climb; such a prop would be most useful on a very calm day. The 8-3 original gave 20 sec. motor run, and the best flight of half a dozen on a cold March day was 1 min. 10 sec.

The finished model, complete with a charged CO_2 cartridge, weighs 4¼ oz. If your model weighs up to 4½ oz. the performance should be very good. And for you confirmed gas modelers who are building this ship just as a novelty, there is one point in favor of the CO_2 powerplant that hasn't yet been mentioned—*one* flip of the prop *always* starts the engine!


»OLYMPIA«
SPECIFICATIONS
Wing Span 49'-6"
Length 21'-0"
Wing Area 151 Sq Ft.
Weight Empty 554 Lbs.
Gross Weight 562 Lbs.
21'-0"
42
To Leading Edge Of Wing
Bulkhead Locations
NX 41855
Tow Hook
Landing Skid
Mono Wheel None Retractable
Fabric Covered
Skid Sections
Spoiler Flap Extended Position
3° 50' Dihedral
Fuselage Sections
Butt Joint
Plywood
49'-6" Span
Spoiler Flap Top & Bottom
12'-3"
Bottom View Of Skid & Gear
LEONARD WIECZOREK
P.T.W.

OLYMPIA GLIDER



WILL the returning airman fly? That was the big question asked by the personal aircraft manufacturers in the summer of 1945. Elaborate questionnaires were filled out by bored veteran airmen on their way home from overseas. Comprehensive studies were prepared and published by the government, aviation groups and aircraft and accessory companies. The consensus was an optimistic "Yes," and lightplane production plans were made accordingly. But buried deep down in this postwar enthusiasm for flying was man's oldest and most graceful flying machine—the glider.

No questionnaires asked about gliding, the purest form of flight. But oldtimers in the gliding game waited confidently while the veterans let the sound of roaring engines and the smell of oil and gasoline sink into silence. As the months slipped by and the urge to fly came creeping back, it was no longer a desire for the noise and vibration and tonnage of the bomber nor the speed and danger of the fighter. It was a desire for flying in its fundamental beauty—a wish for the genuine poetry of flight without the hell of it.

Slowly at first and then more rapidly, the veteran joined a glider club and attended a glider meet. In occupied Germany gliding clubs sprang up with captured German gliders being reconditioned and winches, towlines and tools being oiled up. This rebirth of gliding spread like a prairie fire into France, Sweden, Switzerland and England and the fever quickly reached America. Never before in history has gliding and soaring seen so many new faces as in the past year in the U.S. Glider manufacturers are months behind; gliding clubs are the scene of waiting lines, and new gliding ports are being opened by the dozens.

As ever, the talk is of new glider designs, new aerodynamic refinements, new records and new ideas. But most of this talk strangely enough is of a "new" glider that is eight years old—the *Olympia*, our Plane on the Cover this month.

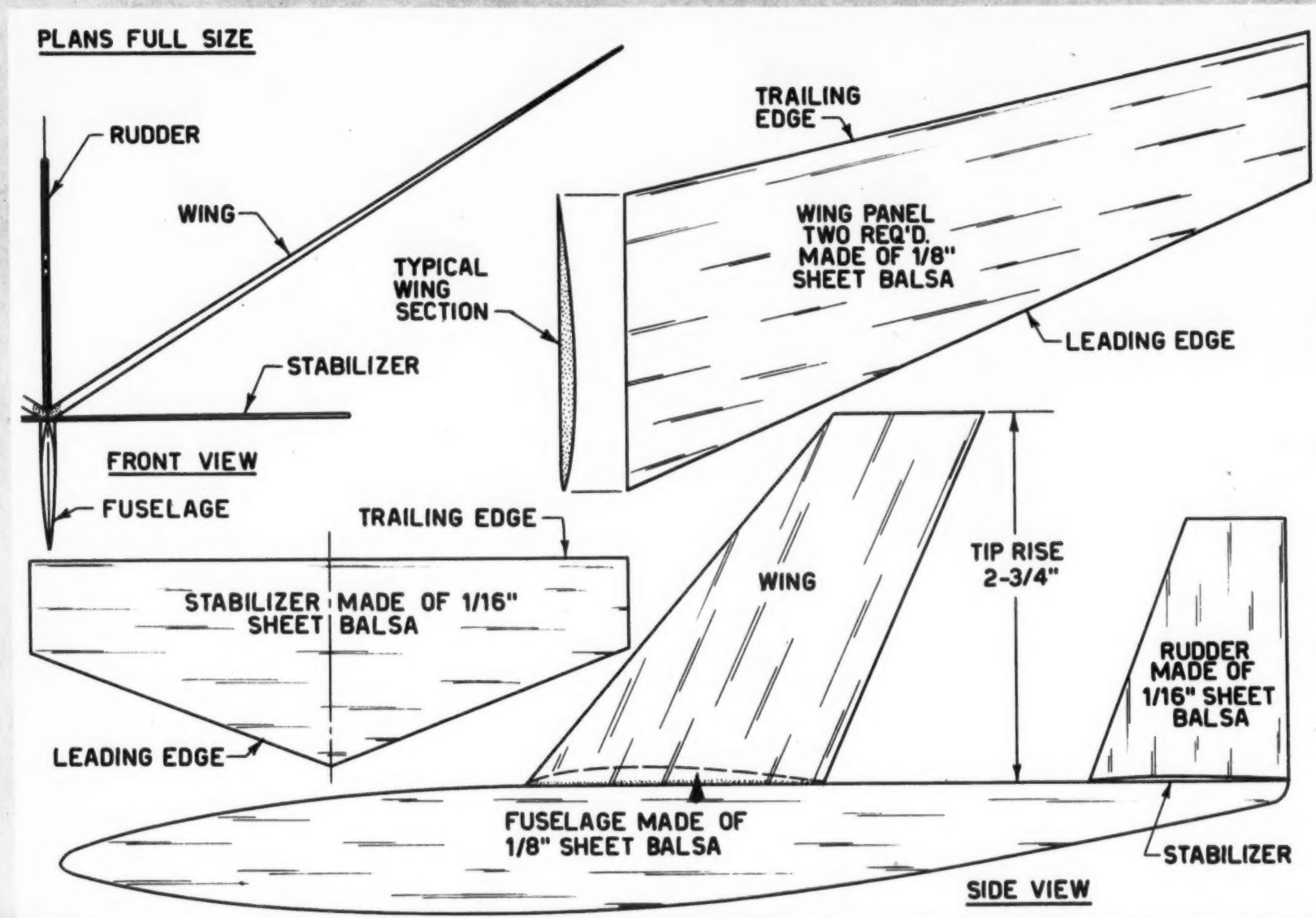
The story of the birth of the *Olympia* illustrates many of the fundamental considerations of international politics and racial traits and habits such as the friendly and sportsmanlike relations of peoples and nations in athletics and competitions of native skills, the energy and technical ambition of the German, the aloofness of the Russian, and the hardheadedness of the Jap.

Following completion of the 1936 Olympics in Berlin the International Olympic Committee chose Japan as the scene for the 1940 games. During the committee meetings it was voted to include gliding competitions for the first time in Olympic history. It was obvious from the start, however, that special rules would be required to insure that the contest would be solely one of individual soaring skill, and for this reason it was desirable that a standard glider be used by all contestants, thereby making the contest one of flying ability and not glider design or construction ability. The question of a standard glider design was referred to the Federation Aeronautique Internationale in Paris. This group requested a special committee, the International Commission for the Study of Motorless Flight, to prepare a set of specifications for a competition.

The Commission held its first meeting in May 1938 in Berne, Switzerland and was composed of a Technical Committee for an Olympic Sailplane under the chairmanship of Dr. W. Georgii of Germany. It included Dr. van der Maas, Holland; Cartier, France; Stepniewski, Poland; Simone, Italy; Kensche, Germany; and Shenstone, Great Britain. Russia, Sweden,

(*Turn to page* 83)

PLANE ON THE COVER STORY


PLANS FULL SIZE
RUDDER
WING
STABILIZER
FRONT VIEW
FUSELAGE
TYPICAL WING SECTION
TRAILING EDGE
WING PANEL TWO REQ'D. MADE OF 1/8" SHEET BALSA
LEADING EDGE
TRAILING EDGE
STABILIZER MADE OF 1/16" SHEET BALSA
LEADING EDGE
WING
TIP RISE 2-3/4"
RUDDER MADE OF 1/16" SHEET BALSA
FUSELAGE MADE OF 1/8" SHEET BALSA
STABILIZER
SIDE VIEW

MODEL AIRPLANE COURSE FOR BEGINNERS

A CAREFULLY PLANNED AND TESTED SERIES OF ARTICLES FOR BEGINNERS IN THE ART OF BUILDING AND FLYING MODEL PLANES

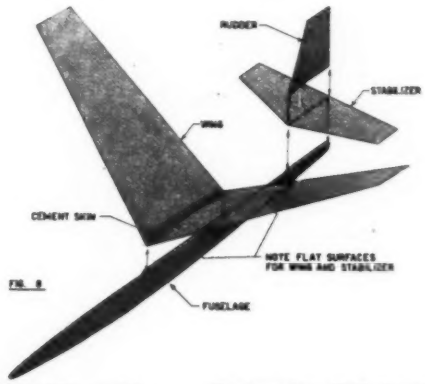


FIG. 8

LESSON 2—Build and Fly an All Balsa High Performance Glider

THIS glider (Fig. 7) is similar in appearance to the model we made in Lesson 1, but its performance will be much superior because we will use wood instead of cardboard. This will make the wing and tail surfaces more rigid, thereby insuring true alignment at all times.

Because extreme lightness is essential, the type of wood used in most model construction is known as "balsa"—obtained from the balsa tree found in tropical jungles. It can be purchased from your local model supply dealer in many sizes and shapes, also in various degrees of hardness: hard, medium or soft. The degree of hardness determines its strength as well as the ease with which it can be worked.

Materials Required. 1. A piece of medium balsa sheet 1/16" thick x 2-1/2" wide—for the wing.

2. Piece of medium balsa sheet 1/16" thick x 2" wide—for stabilizer and rudder.

3. Strip of hard balsa 1/8" thick x 1" wide—for fuselage.

4. Small tube of "model airplane cement."

The balsa sheets and strips come in standard lengths (usually 18" or 36").

Tools Required. 1. A sharp knife; 2. Razor blade; 3. Piece of 2/0 sandpaper; 4. Piece of wax paper; 5. Pencil; 6. Piece of carbon paper. All these can undoubtedly be found in your home except for the sandpaper which you can buy at your model dealer or your local hardware store.

Constructing. Full size plans of the model are furnished to simplify construction. The "Side View" shows correct outline for both the rudder and fuselage; "Front View" shows crossection or "front view" shape of the fuselage and wing.

First we must transfer the outline of the various parts (wing, stabilizer, rudder and fuselage) from the magazine plans onto the balsa stock. This is done by placing a sheet of carbon paper (carbon side down) between the plans and the balsa and tracing the outline of each part with your pencil. Use a ruler or any straight edge as a guide in drawing straight lines that form the rudder, stabilizer, wings and top side of the fuselage. The fuselage nose and underside can be traced freehand. When tracing the wing, note that only one panel is shown in the plans. Actually we must trace this part twice so as to have a complete wing of two panels—left and right.

Fuselage. After the outline of each part has been transferred to the balsa, we start "cutting wood." Begin with the simple fuselage and then proceed to the more difficult structures. As this is made of hard balsa, a sharp knife is needed to whittle away the excess wood around the

(*Turn to page* 68)

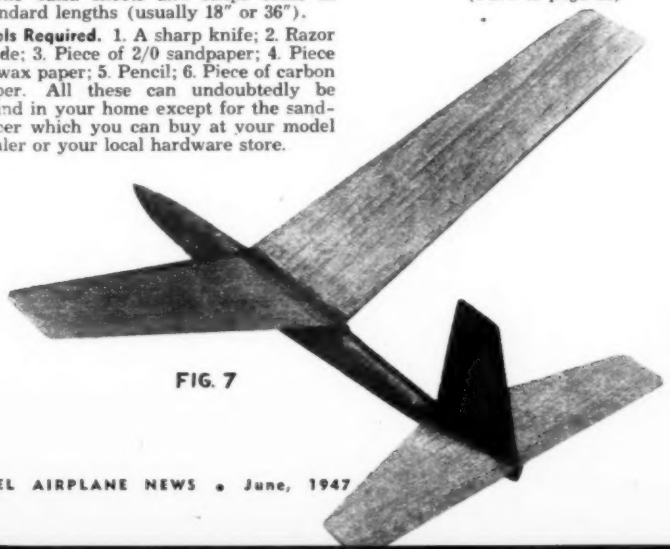
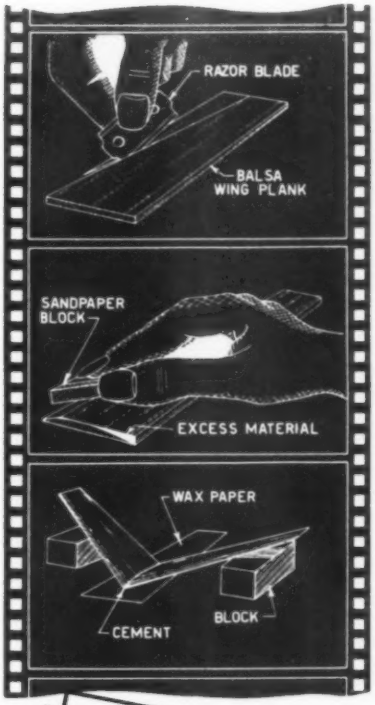


FIG. 7

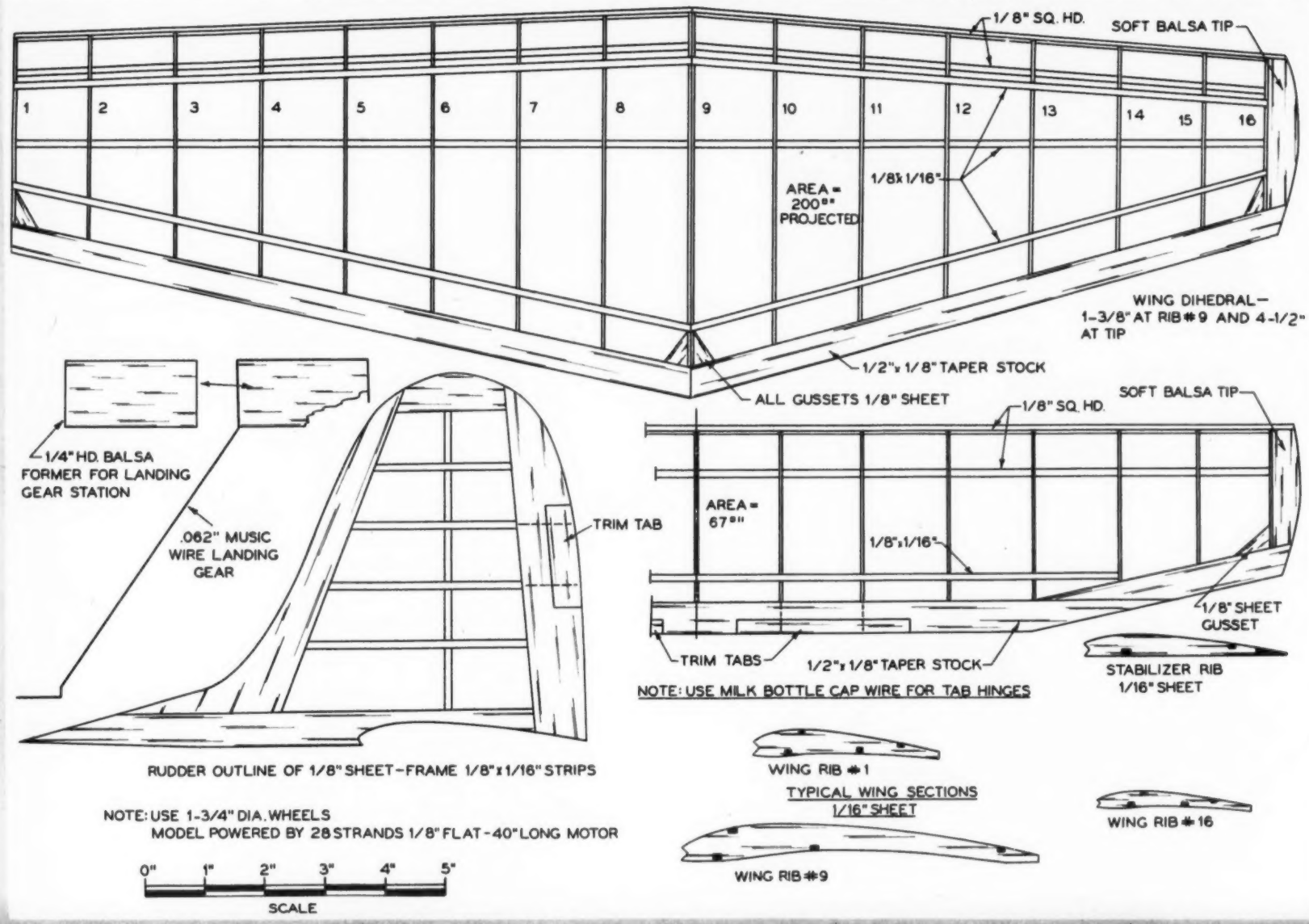


DID YOU KNOW

...THAT plans for a practical miniature gas engine for models were first developed in 1929 by Bill Brown Jr.; but it was a year later that he succeeded in constructing a motor that would even cough a few times.

...THAT the first gas model contest was held May 10, 1932, with four contestants, each using a Brown, Jr., engine.

...THAT Langley's aerodrome No. 5 (long a popular display model at the Smithsonian Institution in Washington, D.C.) on May 6, 1896, achieved a non-piloted flight of over half a mile. The model measures 14 feet in span, weighs 26 pounds, and is powered by a one-horsepower flash-stream engine driving two pusher propellers.


1/8" SQ. HD.
SOFT BALSA TIP
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
AREA = 200 SQ IN PROJECTED
1/8 x 1/16"
WING DIHEDRAL — 1-3/8" AT RIB #9 AND 4-1/2" AT TIP
1/2" x 1/8" TAPER STOCK
ALL GUSSETS 1/8" SHEET
1/4" HD. BALSA FORMER FOR LANDING GEAR STATION
.062" MUSIC WIRE LANDING GEAR
TRIM TAB
RUDDER OUTLINE OF 1/8" SHEET — FRAME 1/8" x 1/16" STRIPS
AREA = 67 SQ IN
1/8" x 1/16"
1/8" SHEET GUSSET
TRIM TABS
1/2" x 1/8" TAPER STOCK
STABILIZER RIB 1/16" SHEET
NOTE: USE MILK BOTTLE CAP WIRE FOR TAB HINGES
WING RIB #1
TYPICAL WING SECTIONS 1/16" SHEET
WING RIB #16
WING RIB #9
NOTE: USE 1-3/4" DIA. WHEELS
MODEL POWERED BY 28 STRANDS 1/8" FLAT - 40" LONG MOTOR
0" 1" 2" 3" 4" 5"
SCALE

THE MONSTER

Wakefield competition will be started again this year—get in on the fun with a Monster of your own

by AL CASANO

THE late Lord Wakefield of Heath will long be remembered for his kindly deeds and his consideration for others. Many of his acts were aimed at international good will and its promotion.

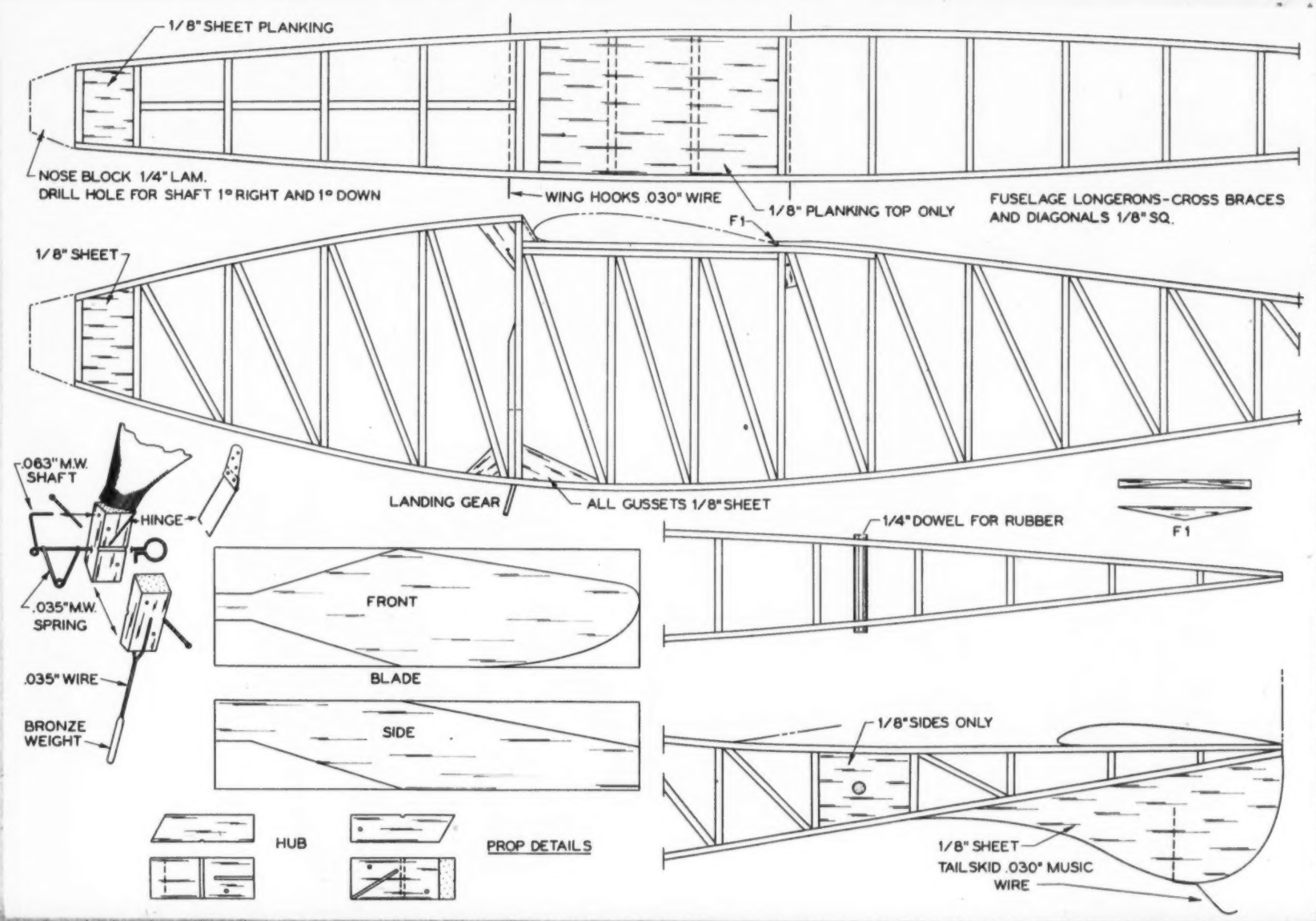
"The Wakefields" was one of this man's brain children, and it is the name of the only recognized international competition for rubber powered model aircraft. Lord Wakefield donated a handsome silver bowl for this competition, the bowl to remain in possession of the winner until won by someone else. The Wakefield Meet is held once a year (wars permitting), in the country last winning the bowl. Our own Dick Korda, USA, was the last winner in 1939, and the Meet will be resumed this year in August or September.

Rules governing the design, building and flying of Wakefield models are both logical and clear. Ships must be of rubber power design with minimum fuselage crossection equal to length squared divided by 100. The wing area must be 200 square inches, which includes only that part of the wing contributing to the lift of the ship or projecting beyond the fuselage. The stabilizer area must not be greater than 33% of projected wing area. This combination makes for good design, but it takes more skill to get good flights with a small stabilizer. Minimum weight is 8 oz.

The Monster was designed to give top contest performance, yet is exceptionally easy to build. This crate was dubbed *The Monster* because all the boys around here built small C jobs during the war due to rubber shortage, and when this comparatively huge crate made its appearance—well, you get the idea. Since there is nothing on this ship that would stump a 12 year old in building, let's give it a onceover lightly.

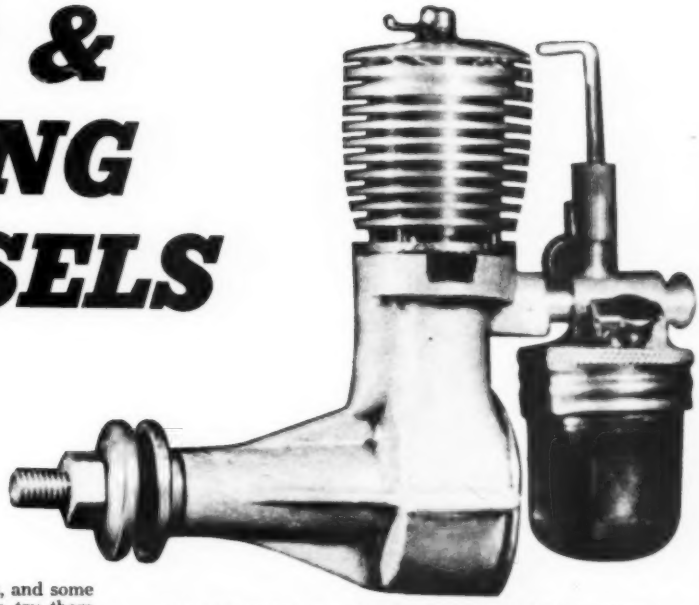
First of all, use hard, straight grained balsa on all longerons and spars. These members must take most of the stresses. Diagonals and crossbraces take relatively little strain and do not have to be rock hard. Use care in lining up fuselage, and sand all parts well with fine sandpaper before covering. This takes off dead weight and makes for a good appearance. Use Silkspan throughout the entire ship for this will add

(*Turn to page* 50)


1/8" SHEET PLANKING
NOSE BLOCK 1/4" LAM.
DRILL HOLE FOR SHAFT 1° RIGHT AND 1° DOWN
WING HOOKS .030" WIRE
1/8" PLANKING TOP ONLY
F1
FUSELAGE LONGERONS-CROSS BRACES AND DIAGONALS 1/8" SQ.
1/8" SHEET
LANDING GEAR
ALL GUSSETS 1/8" SHEET
.063" M.W. SHAFT
HINGE
.035" M.W. SPRING
.035" WIRE
BRONZE WEIGHT
FRONT
BLADE
SIDE
HUB
PROP DETAILS
1/4" DOWEL FOR RUBBER
F1
1/8" SIDES ONLY
1/8" SHEET
TAILSKID .030" MUSIC WIRE

CARE & FEEDING OF DIESELS

by JACK BAYHA



This C.I.E. engine has variable compression and .100 displacement

WE'VE all heard about the new diesel engines, and some of us have been lucky enough to be able to try them out. You have probably heard all kinds of tall tales about them. Suppose, before beginning our discourse on the subject, we explode some of the fancy myths that have been floating around.

The first fallacy is the very name "diesel"! No one at the present time or in the forseeable future will be the proud owner of a practical diesel model airplane engine. Our so-called diesels are actually "compression ignition" engines. This we will explain in detail later. Second in our bureau of misinformation is the rumor that diesels are incapable of high speed operation. How this handicap of early engines has been overcome in recent designs will also be fully elaborated upon later.

Our third item is the notion that ether, the major ingredient in diesel model motor fuels, is injurious to model airplane finishes. Actually ether does not attack the finish of models. This notion is readily explained. In the past ether has always been an ingredient in super hot fuels, such as those using alcohol and castor oil. The alcohol does the damage for which the ether has been blamed. Don't believe us? Try wiping the finish of a model with ether; we guarantee no harmful effects.

Now to elaborate on the diesel vs. compression ignition idea. A true diesel engine, by engineering definition, works as follows:

There is a suction stroke, in which the piston moves down and draws in a charge of air.

Next comes a compression stroke, in which the piston moves up, compressing the air. As the piston nears the top of the stroke, a charge of oil is forcibly injected into the cylinder. The stroke continues until the oil and air mixture explode.

Then follows a work stroke in which the piston travels down violently and supplies energy to the crankshaft.

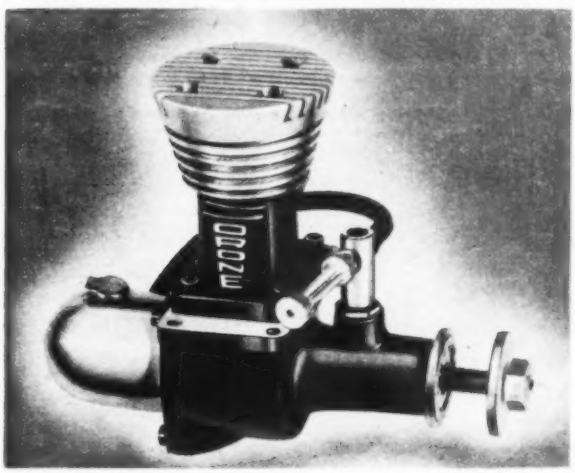
Last comes the scavenging stroke, in which the piston travels up forcing out the exhaust vapors, thus preparing the engine for another cycle.

It will be seen that this is similar in some respects to the action of a conventional four cycle gasoline motor. There are also two cycle diesels which work exactly as do our tiny compression ignition engines with but one exception: where the fuel is injected at the finish of the stroke in the case of the true diesel, the fuel is in the cylinder at the start of the stroke in the case of compression ignition engines.

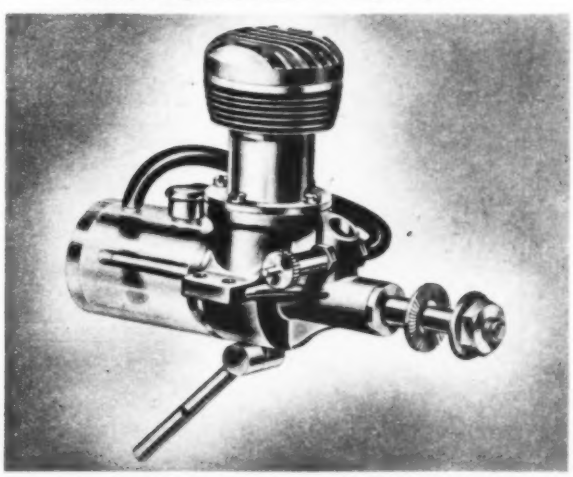
Suppose we look more closely at our baby diesel engine. Yes, we will call them diesels, since we see no reason to be different from other model builders. The huge lumbering giants which are the customary diesel engines used by industry bring about the explosion of the oil vapor through the high temperature reached by the air when compressed rapidly. This extreme compression requires a long piston stroke and an intricate fuel injection system. The long stroke means low speeds—the intricate jet mechanism means complication and possibilities of trouble in the field.

Perhaps we had better explain the reason for a long stroke

(*Turn to page* 46)



Drone is a large Class B diesel with disp. of .297 cu. in.



Mite diesel of .097 disp. has both air and fuel adjustments

150 MPH?

by ROBERT L. BROWN

A PROPERLY designed propeller, more than any other factor, is responsible for the breathtaking control line speeds which are now being recorded throughout the nation. Prizes of unprecedented value were offered during 1946, including two $3400 Ercoupes, transcontinental airplane trips, cash awards, trophies of awesome proportions, and great quantities of model equipment.

One of the most outstanding model builders in the country, Don Newberger of Long Beach, Calif., has finally consented to "unveil" his record breaking propeller design. Now the official holder of both Class C and B speed records, Newberger has flown his sensational *White Comet* at a speed of 134.42 mph. At the Pasadena Rose Bowl, Don flew his smaller Class B model 116.07 mph.

In brief, as speeds increased, propellers became smaller. Class C props have diminished to a 9" diameter with pitch varying from 9" to 14". The prop block is roughly 9/16 x 9/16 x 9 when used with a 2" diameter spinner.

Here are the changes you can make in a propeller to increase the speed of your model. You can (1) decrease area of the blade, and the diameter too, to let the engine reach its most efficient rpm; (2) increase the pitch (take it easy, though); (3) increase the diameter of the spinner to cover the high blade angles near the hub (enabling you to use a little more area in the exposed portion of the blade); (4) use a larger diameter and narrower blades to take advantage of lower tip angles (the maximum limit has already been reached—don't try this); (5) use as hard a wood as is obtainable to allow very thin airfoil sections; (6) use an electric starter held against the spinner, and eliminate the use of heavy washers to increase flywheel action for starting (this makes a higher rpm possible); (7) cut away a little at the trailing edge of the blade near the hub, and add a little near the tip (where the blade angles are lower, and thus more effective).

All of this is pretty much trial and error and requires many hours of flying and recarving of propellers. The best prop design for one make of engine and one model may not show good results at all, if used in another combination of engine and model.

Area and *pitch* are the most important factors of propeller design. If these can be "juggled" correctly, your engine can put out its maximum rpm, the model will barely be able to make the takeoff but will quickly reach its maximum speed within a few revolutions of the flying circle.

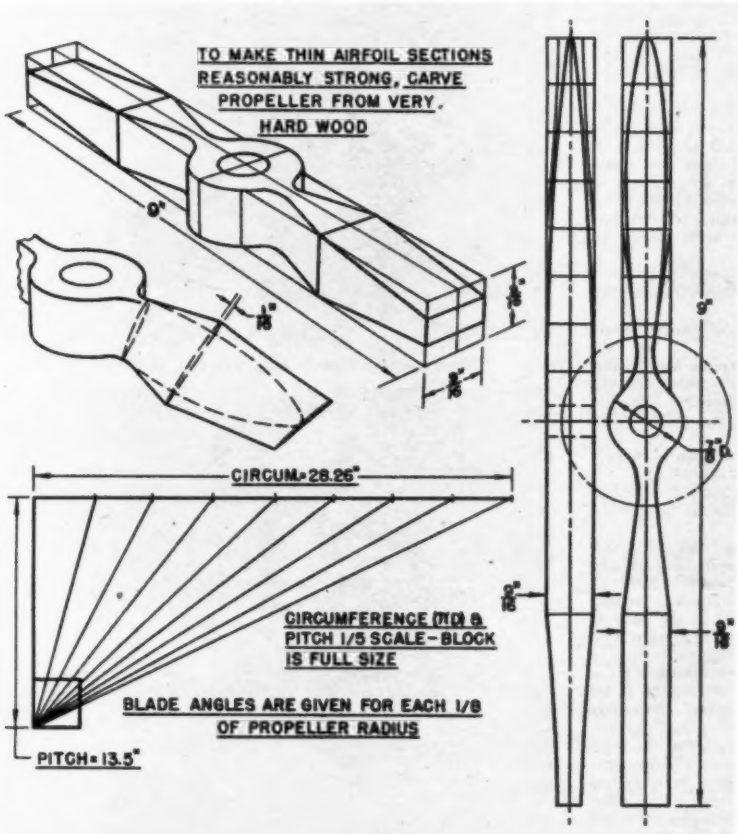
Don Newberger's ship takes off from a generous sized dolly and lands on two small fuselage skids. If you should use his propeller design with a ship which has a wheeled landing gear, is too heavy, of poor design, or hasn't a powerful engine, the model will probably be unable to take off. In short, the best propeller design for a given model is *difficult* to determine.

Of course, most speed models now take off from dollys and land on belly skids or a small wheel partially enclosed in the fuselage. However, many builders who are seeking speed and have a stationary landing gear attached to the model *still* persist in using a tailskid in place of the tail wheel they should have. A prop with high pitch and low area can barely get the plane off the ground with engine wide open. Hold the plane back with a tailskid plowing

(*Turn to page* 64)

Don Newberger, the *White Comet* and trophies won with it

Below. Make your winning toothpick from these plans



WYLAM MASTERPLAN ● WYLAM MASTERPLAN

This sheet concludes the plans of the Sopwith Dolphin.

© 1967 WILLIAM A. WYLAM

AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.

SCALE: 4"=1'-0"

DATE:

DRAWN BY W.A.WYLAM

FUSELAGE DETAILS
ENGLISH SOPWITH "DOLPHIN"

5F.1

Shutter Cowl (Optional)
Side Radiator
Elevator Control Cable
Rudder Control Cable
Tail Skid Control Cable
Brace Wires - Horn
Engine Mount
Rudder Bar
Control Column
Aldis Gunsight Tube
Empty Shell Case Chute
Empty Link Chute
Vickers Gun Mount (Mounted on Engine)
Cabane Posts
Aux. Fuel Tank
Shoulder Strap
Bevel Gear Housing (Shutter)
Double Rudder Control Cables
Elevator Control Cable
Plywood Back
Plywood Formers
Fairing Strips
Turnbuckle & Eye
Tailskid Cable
Double Rudder Cables
Pulleys or Fairleads
Tubular Cabane Structure
Instrument Panel
Cabin Top
Engine Throttle
Rudder Horn
Shockspring
Tailskid Horn
Plywood Shelf
Aux. Fuel Tank
Elevator Control Cables
Oil Tank
Engine Mount
Front Spar Mount
Landing Gear Mount
Rudder Control Bar
Engine Mount
Push-Pull Tube
Plywood Floorboard
Main Fuel Tank
Empty Link Chute
Empty Shell Case Chute
Ammunition Box
Compass
Altimeter
Inclinometer
Airspeed
Ignition
Oil Temperature
Clock
Throttle Sector
Shoulder Straps
Shutter Control
Shutter Panel
Aux. Fuel Tank
Main Fuel Tank
Rear Spar Mount
Metal Nose Fitting
Plywood Web
Aileron Control Cable
Gun Control
Rudder Bar
Plywood Floorboard
Aileron Control Cable
Front Spar Mount
Shutter Cowl (Optional)
Rear Spar Mount
Elevator Control Shaft
Push-Pull Elevator Shaft
Water-Line To Engine Pump
Plywood Ribs
Plywood Fairing Panels (From "K" To Tailpost)
Fuselage Structure (Minus Wires)
Combination Header-Expansion Tank
Water Line From Engine
Fuel Pressure Line
Aux. Fuel Tank
Fuel Line To Carburetor
Pet Cock & Drain Line
Air Pressure Line
Direct Drive
Gun Control Buttons
Rudder Control Bar
Aileron Control Cable
Double Rudder Cables
Tailskid Cables
Elevator Cables
Control Column
Pivoted Shaft
Hispano-Suiza Oil Sump Casings (Typical Hall-Scott Version)
Main Fuel Tank
Petcock & Drain
Fuel Line To Carburetor
Reserve Fuel Tank (Optional)
Water Temperature Gage
Fuel Line To Carburetor
Fuel Pressure Line & Gage
Air Pressure Release Line
Water Line To Engine Pump
Water Line From Engine
Header And Expansion Tank (Water)
Flight Control Details
Shutter Cowl
Shutter Panel
Rubber Ring
Control Cables
Steel Shockspring
Filed Steel Bracket
Horizontal Pivot Plate
Vertical Pivot Point
Steel Shoe
Sopwith "Dolphin" Cooling System
Tailskid Details
Empennage Control Cable Details

WYLAM MASTERPLAN ● WYLAM MASTERPLAN

THE TERM "S.E." MEANS SCOUTING EXPERIMENTAL, NOT SOPWITH EXPERIMENTAL AS BELIEVED BY MOST W.W.I FANS. SOPWITH HAD NOTHING TO DO WITH THE S.E.-5's; I WISH TO CORRECT THIS ERROR THAT WAS ON THE ORIGINAL DRAWINGS (DECEMBER 1960 M.A.N.) THE WING DIMENSIONS GIVEN IS CORRECT FOR THE S.E.-5A ONLY; THIS WAS DUED TO THE CLOSING OF THE GAPS ($\frac{1}{2}$") WHERE THE WING PANELS WERE ATTACHED TO THE FUSELAGE, AND TO THE CENTER PANEL. (SPAR ATTACHMENT FITTINGS WERE RE-DESIGNED FOR THE S.E.-5A).

BY PULLING TRIP WIRE IN COCKPIT, THE LEWIS GUN CAN BE PULLED DOWN ON GUN RAIL BY HAND (FOR RE-LOADING). GUN CAN BE SET IN ANY VERTICAL ANGLE (FROM PROPELLER DISC UP TO 45° BY TIGHT PIVOT & LOCK)

1915 OR M1919 LEWIS
GUN CONTROL WIRE (OPTIONAL)
TRIP WIRE
LARGE WINDSHIELD
ALDIS GUN SIGHT TUBE (OPTIONAL)
MACHINE GUN BRIDGE
AMMUNITION BOX
EMPTY BELT CHUTE
EMPTY SHELL CHUTE
AMMUNITION BOX
EMPTY BELT BOX
EMPTY SHELL CHUTE

TWIN VICKERS MACHINE GUN INSTALLATION

U.S.A. (KELLY FIELD)
RED
WHITE
BLUE
ORANGE-YELLOW UPPER & LOWER SURFACES OF WINGS & HORIZ. STAB.

U.S.A. (OVERSEAS)
RED
WHITE
BLUE
WHITE OR BLACK TRIM

R.A.F.

MAX. DIAMETER
EDGE TRIM (WING COCKADES)
EDGE TRIM (FUSELAGE COCKADES)
THE WING COCKADE'S MAX. DIA. WAS 4'-11"; THE FUSELAGE COCKADE'S MAX. DIA. WAS 1'-6". THE EARLY COCKADES HAD NO EDGE TRIM; EDGE TRIM WAS WHITE OR YELLOW

FROM WING EDGES
WHITE IDENTIFICATION LETTER

NO. 1 SQUADRON (R.A.F.)
U.S.A. PILOT IDENTIFICATION (R.A.F.)
U.S.A. PILOT NUMBER IN SAME POSITIONS

S.E.-5 ONLY (BOTTOM SURFACE OF LOWER WING)

WHITE (SAME POSITION ON BOTTOM SURFACE OF FUSELAGE: NO SQUADRON MARKINGS ON WINGS)

BLACK IDENTIFICATION LETTER OR NUMBER SAME COCKADE WITH OR WITHOUT EDGE TRIM (BOTTOM SURFACE OF LOWER WING)

UPPER & LOWER SURFACES OF WING & HORIZ. STABILIZER WERE BUFF (BEFORE 1916); AFTER 1916, THE UPPER SURFACES WERE ALL KHAKI WITH BUFF ON THE LOWER SURFACES OF THE WINGS AND THE HORIZONTAL STABILIZER.

NOTES:
SERIAL NUMBERS WERE PAINTED ON THE FIN OR RUDDER; AND SOMETIMES ON THE FUSELAGE SIDES. FLIGHT COLORS WERE PAINTED ON SHUTTERS, ENGINE COWLS, RADIATOR SHELL, OR WHEEL DISCS.

EITHER ALL BLACK WITH WHITE TRIM, ALL WHITE, OR ALL BLACK (INDEX LETTER WAS SEPERATED WHEN ENTIRE SERIAL NUMBER WAS ON ONE LINE)

C'507

EITHER ALL WHITE OR ALL BLACK (NIGHT FLIGHTS)

F
8507

TYPICAL VERTICAL STABILIZER MARKINGS

BLACK
F 5489
WHITE TRIM ON COLORED BACKGROUNDS

F 5489
ALL BLACK

D 276
WHITE
BLACK

TYPICAL RUDDER MARKINGS

F'5489
WHITE WITH BLACK TRIM, ALL WHITE OR ALL BLACK

F'5489
ALL BLACK ON WHITE RECTANGULAR PANEL

TYPICAL FUSELAGE MARKINGS (AFT OF COCKADE)

AMERICAN SQUADRONS WITH THE R.A.F. HAD SAME COLOR JOB AS THE S.E.-5A WITH CHANGE ON COCKADES.

RED
BLUE
WHITE
BLUE
RED

17

MODEL "E"
HISPANO-SUIZA
TWO-BLADED PROPELLER

21'-3" S.E.-5A ONLY

ENTIRE FUSELAGE, VERT. STAB., & WING STRUTS WERE KHAKI. BLACK PROPELLER

HEADREST WAS OPTIONAL ON S.E.-5 & S.E.-5A

BLUE
WHITE
RED
SERIAL NUMBER POSITIONS

MODEL "D" & "E"
HISPANO-SUIZA
TWO OR FOUR BLADED PROP

BLACK (STEEL)
KHAKI DISC

WHITE SQUADRON MARKINGS
WHITE OR YELLOW EDGE TRIM
WHITE IDENTIFICATION LETTER OR NUMBER

AMERICAN TRAINING S.E.-5A'S AT KELLY FIELD HAD KHAKI FUSELAGE AND VERTICAL STABILIZER. THE WINGS AND HORIZONTAL STABILIZER WERE ALL ORANGE-YELLOW

2-13

MODEL "E"
HISPANO-SUIZA
TWO-BLADED PROPELLER

WHITE
BLACK
KHAKI

20'-0½" (S.E.-5 ONLY)

EARLY S.E.-5 WERE ALL SILVER WITH KHAKI WING STRUTS AND LANDING GEAR (LATE S.E.-5 WERE ALL KHAKI)

7-10

MODEL "A" SERIES
HISPANO-SUIZA
TWO-BLADED PROPELLER

KHAKI (WOOD)
SILVER OR KHAKI

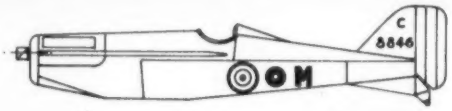
WHITE TRAINING SQUADRON NUMBERS
NO COCKADE EDGE TRIM (EARLY S.E.-5)

NOTES:
IT IS ALMOST IMPOSSIBLE TO LIST ALL SQUADRONS AS TO THEIR EQUIPMENTS SUCH AS SINGLE OR TWIN VICKERS, 1918 OR M1919 LEWIS, TWO OR FOUR BLADED PROPELLER, SMALL OR LARGE WINDSHIELD, DIRECT OR REDUCTION GEARED ENGINE (S.E.-5A OPTIONAL), WITH OR WITHOUT HEADREST, OR CORRECT SERIAL NUMBERS FOR THE MISSING SQUADRONS (WERE REMOVED FROM PHOTOGRAPHS BY CENSORS OF WORLD WAR I). THE KNOWN SQUADRON THEIR SERIAL NUMBERS, AND PILOT'S IDENTIFICATIONS & NUMBERS ARE ON THE SQUADRON MARKING PAGE.

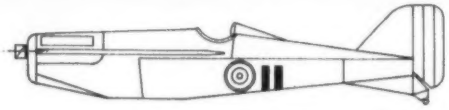
THANKS TO OWEN G. THETFORD & LEONARD BRIDEMAN OF PROFATE & LONDON, ENGLAND

AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.	
SCALE:	COLOR SCHEME DETAILS U.S.A. AND R.A.F.
DATE:	
DRAWN BY ... W. A. WYLAM	S.E.-5

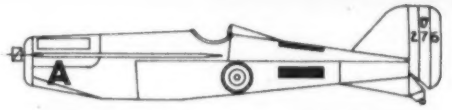
WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN



No.1 Squadron

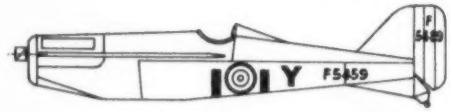


No.41 Squadron

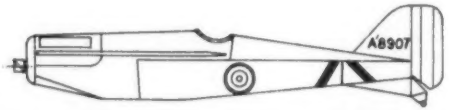


Captain Mannock's S.E.-5A

No.74 Squadron

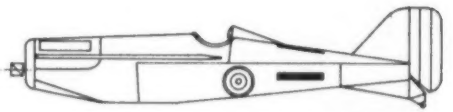


No.24 Squadron

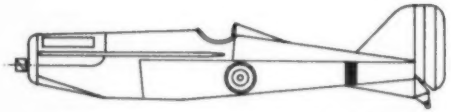


Captain Ball's S.E.-5

No.56 Squadron



No.84 Squadron



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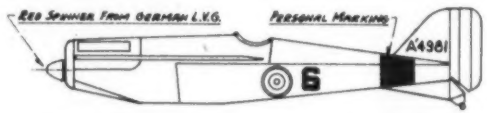
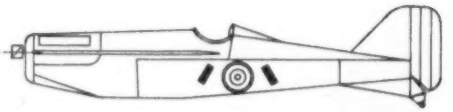


Captain McCudden's S.E.-5

No.56 Squadron



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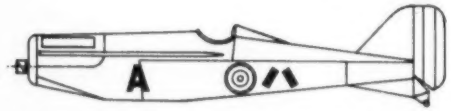
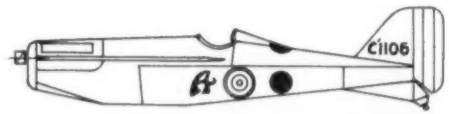
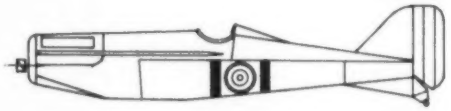


No.32 Squadron

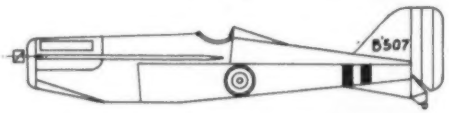


No.60 Squadron

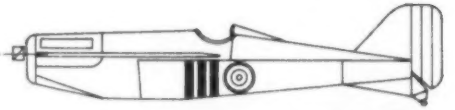
No.85 Squadron



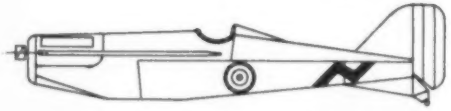
No.40 Squadron



No.60 Squadron



No.92 Squadron



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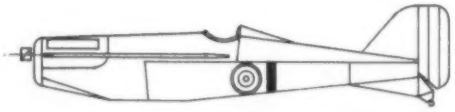
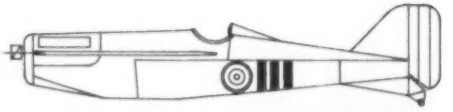
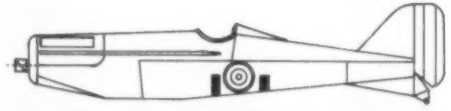


No.64 Squadron



No.94 Squadron



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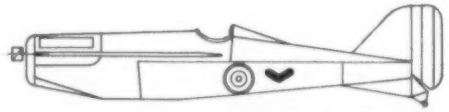
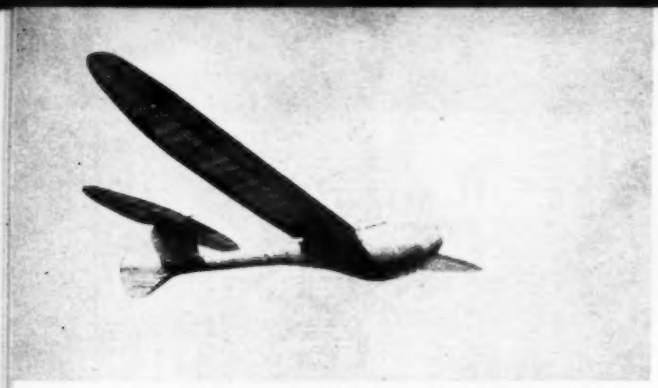


No.68 Squadron

Full Credit Is Given To Mr. Owen Thetford Of Prodate, England, For This Tedious Work.

AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.	
SCALE:	Squadron Markings Royal Air Force
DATE:	
DRAWN BY ... W.A.WYLAM	S.E.-5

WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN

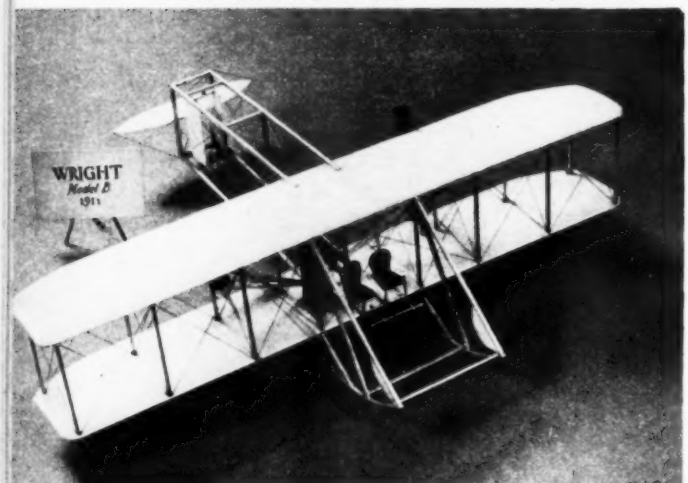


No. 1 Beautiful glider flying in France, built by G. Fontaine

No. 2 Andy Koskinen's Flamingo is a highly successful ship

AIR WAYS

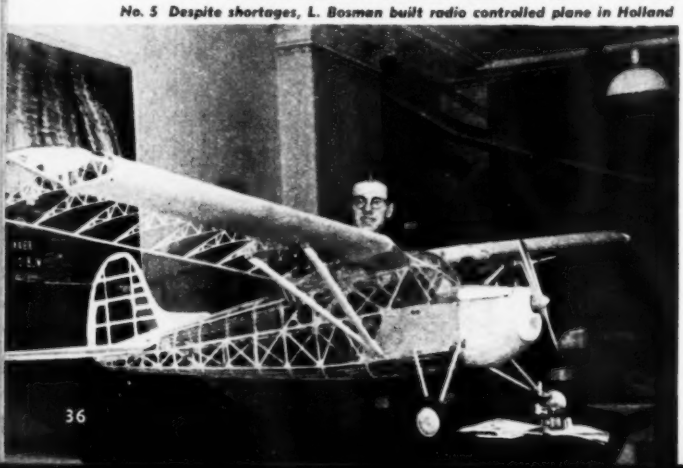
News of model airplane experimenters from all over the world

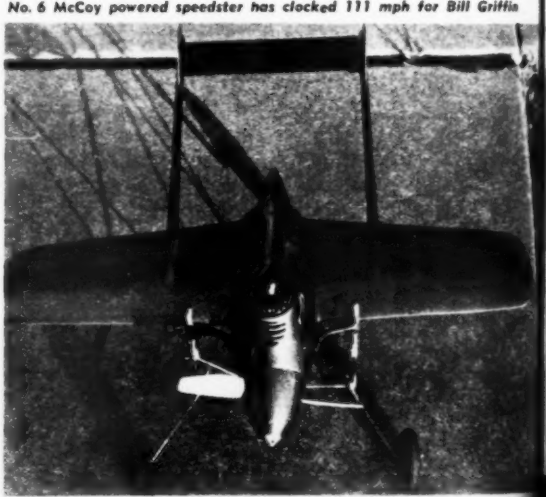


No. 3 An antique painstakingly modelled by George Hardie, Jr.

No. 4 A Westerner built in Australia—submitted by R. T. Harwood

No. 5 Despite shortages, L. Bosman built radio controlled plane in Holland

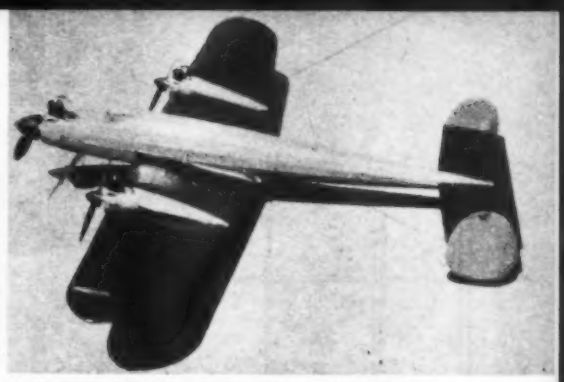




No. 6 McCoy powered speedster has clocked 111 mph for Bill Griffin

No. 7 Rubber powered Cub Coupe from W. H. Dashiell

No. 8 Gordon Snow built this remarkably accurate model of the B-17



No. 9 Triple Trouble, control liner by Rehfield brothers

LATEST NATIONALS DATA. While we hope that all prospective entrants to the Nats have made their plans by the time this is printed, we include a bit more information for the uninformed.

The various age groups are: Juniors, under 16 years of age; Seniors, 16 to 20 inclusive; Adults, 21 and over. The list of number of contestants per state who will be qualified to enter the Nats is too long to reproduce here, but the range is from 5 in the smaller states (or those with low relative population) to 45 for New York. A maximum of ⅓ the total number of qualifying entrants from each state may be in the Adult classification, and not less than ⅓ shall be Juniors. Contestants may enter only those events at the Nationals for which they previously qualified in state contests. The events are:

HL gliders (Indoors)
Stick HL (Indoors)
Cabin ROG (Indoors)
Combined stick or cabin rubber
Wakefield cabin rubber
Towline gliders
Free flight gas, Classes A, B, C
Control line gas, three classes
Control line stunt, three classes
Radio control
Flying scale (rubber, free flight or control line—must make qualifying flight of at least 30 seconds)

In addition to the first place winners of last year's Nationals and the qualifiers this year, the 1946 National Champ and Junior and Senior Champs are eligible. Also, *all entrants* for the Radio Control event will be accepted. Such entrants must, however, register by mail with the National Championship Contest Committee on or before August 1, 1947. Such registrations should be sent directly to the Chairman of this committee, Clarence W. Hinck, c/o Hinck Flying Service, Metropolitan Airport, Minneapolis, Minn. Registration blanks will be available at all state meets or from the Office of the Department Adjutant of the American Legion.

No contestant will be allowed to participate in the Nationals unless properly certified or registered in advance. All contestants under 21 years of age must provide signed approval of their parent or guardian, assuming full responsibility for the contestant from the time they leave home until they return.

Information on all phases of the Nationals or qualifying meets may be had from: Special Activities Section, National Headquarters, The American Legion, 777 N. Meridian St., Indianapolis, Ind.

EAST-WEST MEET. We received from Tom Herbert a detailed account of his recent trip west, one of the main objects of which was to arrange details for the coming control line classic. The boys really gave him a big time, including a special dinner in his honor by the gang in the Bay Area, headed by Roy Mayes. Tom has some strong ideas on the Novice vs. Professional controversy and favors the development of regular Pro contests such as are held in most other fields of sport. In closing, Tom sends his heartfelt thanks to the California boys who made his trip so pleasant and who will be his bitter rivals a few months from now.

A NEW FUEL. Had a letter from Bruce Wennerstrom who told of an amusing incident that occurred recently when some of the fellows were test flying control liners in Penna., with the usual crowd of uninitiated bystanders enjoying the activities. One of the flyers kept his fuel in a "coke" bottle and siphoned it directly from the bottle to the tank in his ship. Since the fuel was just the color of the popular beverage the bystanders thought the boy was running his motor on soft drink and were suitably impressed . . .

CORRECTION. In our latest coverage of model motors (page 40, April 1947 M.A.N.) the *Mighty Midget* motor, which is a Class C type with .451 cu. in. displ., was erroneously listed as having a power rating of 1/6 hp. This of course is far from the correct figure, and we are informed that this motor will consistently produce .6 hp.

• •

Picture No. 1 shows a glider built by G. Fontaine, Thourotte, Oise, France. This photograph, chosen from a group of larger models, shows a glider of "only 6 ft. wingspan." The builder writes that it flies very well.

Andy Koskinen, 479 Linden Ave., Bogota, N.J., sent in No. 2 of his original design *Flamingo*. This model has a 31" wingspan and one blade folding prop; the tail assembly and wing are detachable; it has a Grant X-8 airfoil on wing and Clark Y on stabilizer. The model flies in an extremely stable manner with a long, flat glide.

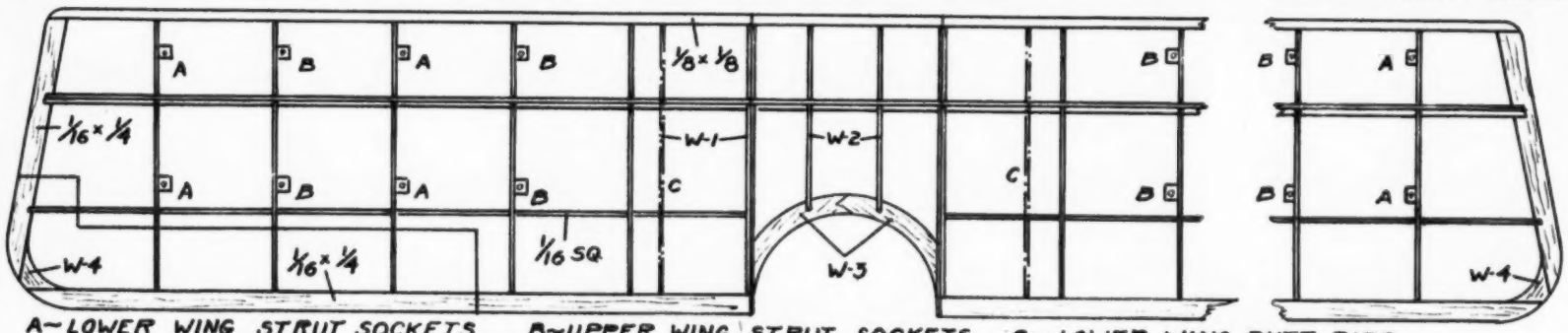
No. 3 shows a ¼" scale model of the Wright Model B built by George Hardie, Jr., Route No. 1, Box 157, Hales Corners, Wisc., and photographed by Jim Steffek. This model was built ten years ago using drawings which appeared in Grover Loening's "Monoplanes and Biplanes"

(*Turn to page 42*)

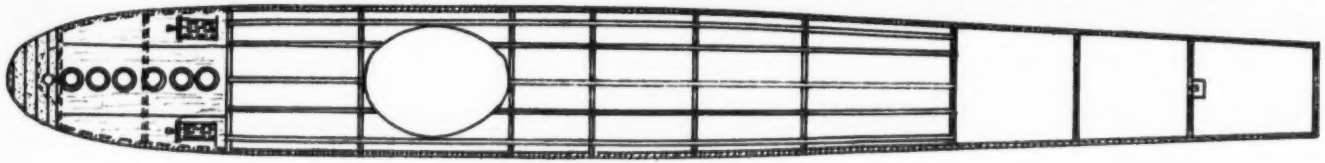
No. 11 Jerome Lewis holds original free gassie

No. 10 Control bipe by Tage Nissvik of Sweden has homemade diesel

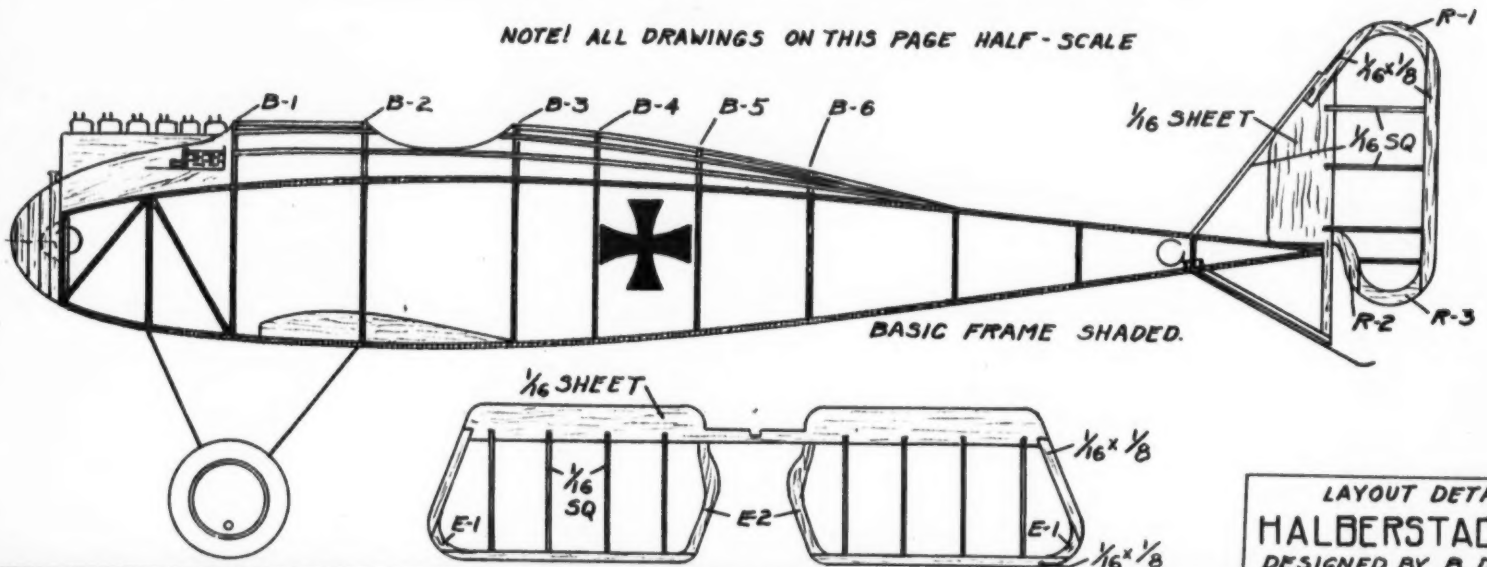
No. 12 High performance rubber job is design of Eddie Campana



A~LOWER WING STRUT SOCKETS B~UPPER WING STRUT SOCKETS C~LOWER WING BUTT RIBS



NOTE! ALL DRAWINGS ON THIS PAGE HALF-SCALE



BASIC FRAME SHADED.

LAYOUT DETAILS
HALBERSTADT D-1
DESIGNED BY B. DANIELSEN

HALBERSTADT D1

by BERNE DANIELSON

HERE'S a beautiful little job for you World War I model fans. Of sturdy but light construction, it is also a good flier.

The real ship was roaming Western European skies in 1915 when it was one of the backbones of the German Air Force. Dimensions were: span 8.7 meters; length 7.4 meters; height 2.9 meters. Gap between the wings was 1.32 meters, and the chord of both wings was 1.56 meters.

The coffee grinder up front was the Opel *Argus*, which supplied 120 hp to a wooden prop 2.4 meters in diameter. Fuel came from an 18 liter gravity tank situated in the upper wing centersection beside the radiator. Armament consisted of two Spandau machine guns on the cowl, firing through the prop.

Now let's get on with the construction which, incidentally, is very similar to that of the real ship. Start by scaling up the plans double size. Use 1/16″ square hard balsa or pine to lay out the sides of the basic frame which is shaded on the plans. Connect the two sides with the crosspieces, starting at the tail. Glue on the body formers (cut from 1/16″ sheet balsa) and add the 1/16″ square stringers. Cover the top from B-1 to B-3 with stiff paper, then cut out the cockpit. Build up the engine block from 1/16″ sheet, and add the side pieces of the cowl, which are carved from soft balsa. Hollow these out on the inside for lightness. Add all details later. On the bottom longeron glue in the forms to which the lower wing will be fastened. The noseblock can be carved from a single piece of balsa or from several sheets glued together.

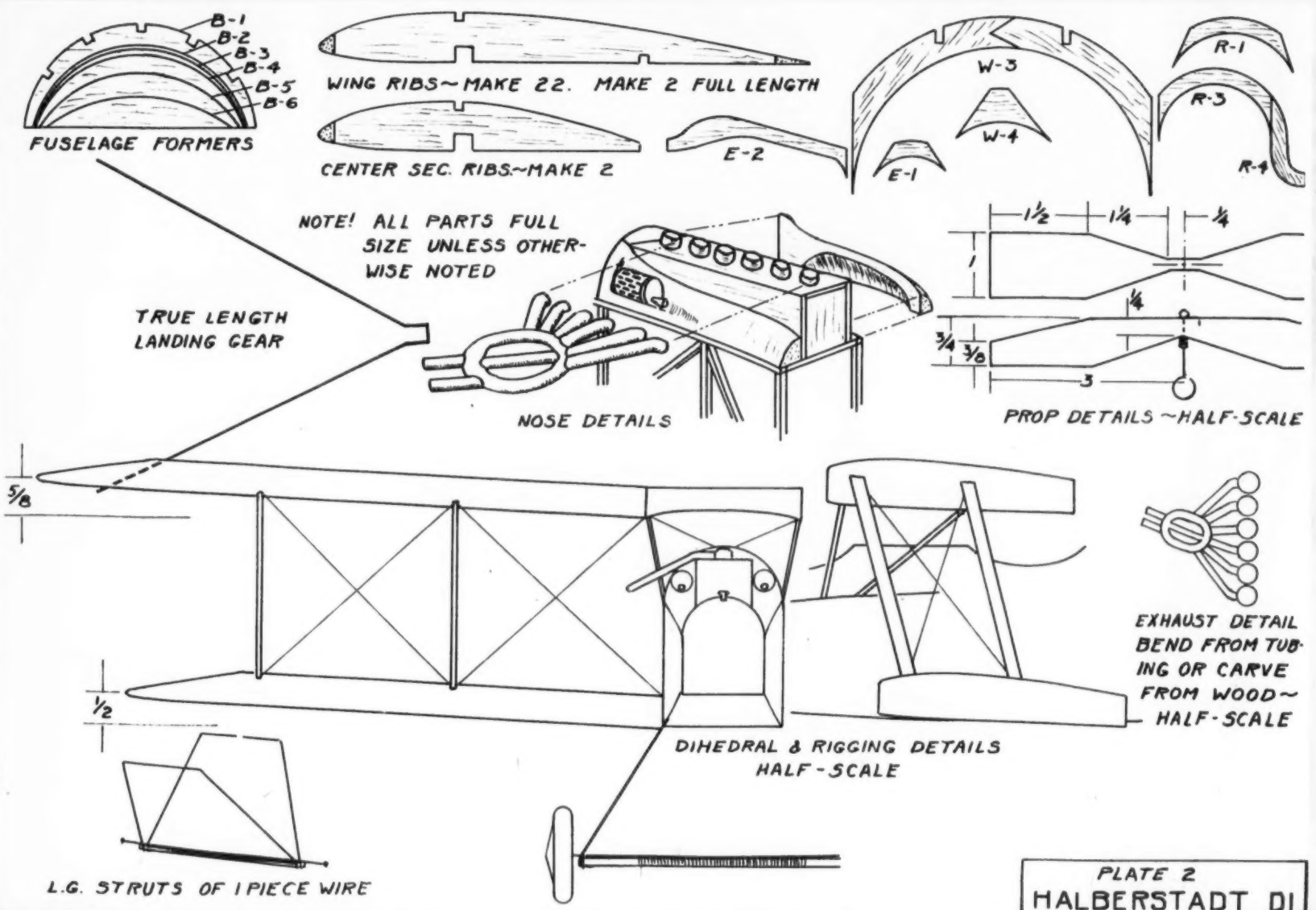
Build each wing panel separately. The lower wing, as shown on the plan, has its butt ribb at point C, so do not put in the rib right next to it—this is for the upper wing only. On the upper wing, glue into position the strut sockets on the bottom edge of the ribs and to the top edge of the ribs on the lower wings. These strut sockets are cut from 1/16″ sheet, and a 1/16″ dia. hole is cut in them.

The rudder and elevator are, of course, built directly over the plans. Orthodox construction is used throughout.

Bend the landing gear from one piece of 3/64″ wire with the break at the rear fuselage attachment. Glue it into position and wrap with strong thread. The spreader bar is 1/8″ square, preferably hardwood, and is glued and wrapped in position. 3/64″ wire is also used for the axle which is attached to the spreader bar with glue and wrapping only to the point shown on plate 2. This affords some shock-absorbing qualities. Realistic wheels can be made by altering ordinary wooden wheels. Cut a circular piece of stiff paper, cut out a small segment, and glue these edges back together to form a very shallow cone; then glue to the outside of the wheel. Brace the rear hook attachment with two extra 1/16″ strips, and glue and wrap in the hook and tailskid. Use plenty of glue here.

Cover all parts before assembly. Green paper was used in the original but any color can be used. Spray with water first; then put on two coats of thin clear dope. Take care that there is no warping, especially in the tail surfaces.

(Turn to page 72)


B-1
B-2
B-3
B-4
B-5
B-6
FUSELAGE FORMERS
WING RIBS~MAKE 22. MAKE 2 FULL LENGTH
CENTER SEC. RIBS~MAKE 2
E-2
E-1
W-3
W-4
R-1
R-3
R-4
NOTE! ALL PARTS FULL SIZE UNLESS OTHERWISE NOTED
TRUE LENGTH LANDING GEAR
NOSE DETAILS
1½
1¼
¼
1
¼
¾
3/8
3
PROP DETAILS ~HALF-SCALE
5/8
½
L.G. STRUTS OF 1 PIECE WIRE
DIHEDRAL & RIGGING DETAILS HALF-SCALE
EXHAUST DETAIL BEND FROM TUBING OR CARVE FROM WOOD~ HALF-SCALE
PLATE 2
HALBERSTADT DI

design forum

by CHARLES H. GRANT

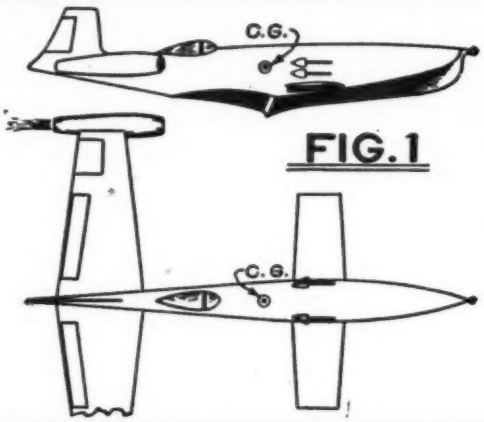


FIG. 1

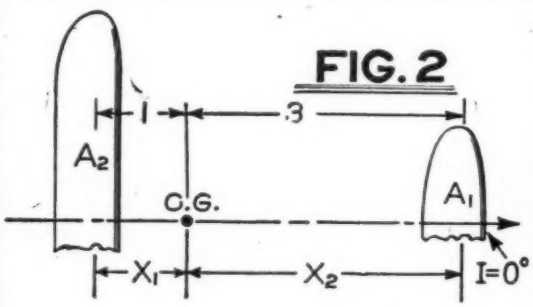


FIG. 2

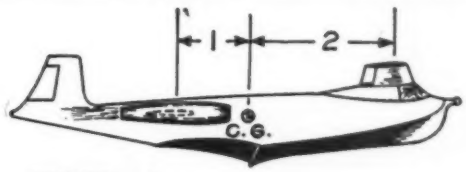


FIG. 4

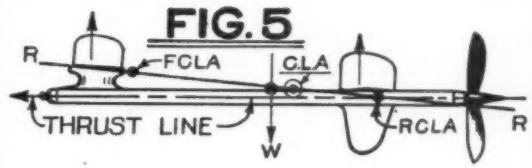


FIG. 5

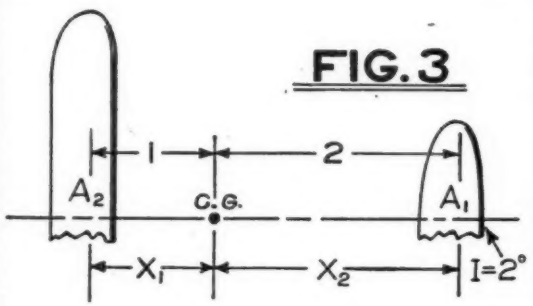


FIG. 3

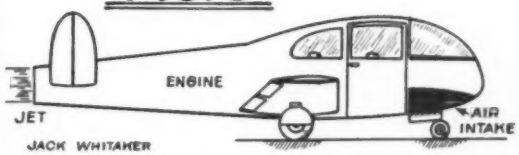


FIG. 6

THE pioneering spirit of model builders is beginning to come to life again. Many who witnessed the 1946 Nationals feared that the spirit of experiment was dead because 99% of the planes flown were of standard and old design or were kit models. One contestant met the challenge of originality and outperformed nearly all others with his rubber powered canard pusher. Evidently interest in canards (planes with large wing at rear, small one in the front) has grown from this incident and from other discussions about this type of plane in previously published articles because a number of our readers have submitted designs for this type of ship. Few are without fault in design. Consequently our discussion here will chiefly concern the vital points of canard design.

As an example of what *not* to do, we show a design submitted by Paul Audette, Montreal, Canada, Fig. 1. The design itself is pleasing to the eye, but all essential aerodynamic factors are in complete *disarrangement*. To design a successful canard type plane there are certain basic requirements that must be adhered to in all cases. Regardless of the details of the design these requirements must be fulfilled, and it is not too much to say that if model builders and even large plane designers will satisfy the conditions that follow, their canard designs will be highly successful.

The first basic requirement is the relative size of the two wings. This is the starting point in proportioning your plane after its size has been determined. The smaller front wing should have approximately 1/3 the area of the larger rear wing. Some models have a front wing with 1/4 the rear wing area and they fly very well. Best results, however, have been obtained with the 1/3 proportion. Full scale aircraft have used forward wings which have only about 15% the rear wing area. Smaller front wings give more sensitive and immediate control; this no doubt is the reason for their use in full scale aircraft. However, in models sensitive control is not an issue. In fact the model should not be sensitive but steady in flight. Therefore front wings of greater area are used.

The next requirement is to locate the center of gravity (CG) in the correct position relative to the wings. This is the most important factor in canard design and the one which most designers neglect. Its position can best be shown by analyzing the reason for it. The weight of the airplane is supported by both front and rear wings of the canard. The center of this weight, therefore, must lie some-

(*Turn to page* 56)

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2-6b	DeH-4 Fusel. Scarff Ring Details
3-6a	S-VII SPAD Gen. Arr.
3-6b	S-VII SPAD Layout
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4-6b	VICKERS mach. gun Gen.Arr.
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7-6b	S-XIII C.1 SPAD Layout
8-6a	S-XIII C.1 SPAD Fusel. & Wing.Det.
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9-6b	D-5 & D-6 ALBATROS Layout
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10-6b	D-1 to D-6 ALBATROS Fusel. Struct. Det.
11-6a	S-XIA-2 SPAD Gen.Arr. Part 1
11-6b	S-XIA-2 SPAD Layout
12-6a	S-XIA-2 SPAD Gen.Arr. Part 2
12-6b	S-XIA-2 SPAD Fusel. Details
1-7a	D-4 SIEMANS SCHUKERT Gen.Arr.
1-7b	D-4 SIEMANS SCHUKERT Layout
2-7a	D-4 SIEMANS SCHUKERT Fusel. Det.
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Air Ways

(*Continued from page 37*)

published in 1910. George has plans for a good share of the types of aircraft built in this country from the time of the Wrights and he is constantly adding to this collection. It is his ambition to use this material at some future date to build a collection of scale models of historically important types showing the advancement through the years for a display in the Milwaukee Museum—with the help of as many modelers as he can find. He would like to contact any scale model fans in the Milwaukee area to get their reaction to his plan. He feels that with the possibility of a new museum being built in Milwaukee, this would offer an opportunity to do something constructive and educational with a hobby.

R. T. Harwood, 10 Queen Street, North Williamstown, Victoria, Australia, submitted No. 4 of his 7 ft. *Westerner*, powered by a *Barker* engine. He writes that modeling in Australia is hampered by the dire lack of good engines and accessories. A recent U-Control speed contest was won by a model powered by a Brown which clocked 58 mph.

L. J. Bosman, 105 St. Willibrordusstraat, Amsterdam, Holland, sent in No. 5 of his Fairchild 27. This model has a 12 ft. wingspan, weighs 205 ounces, has 18 sq. ft. wing area and 5 sq. ft. stabilizer area; overall length is 8'. It is equipped with a 1½ hp motor with a displacement of 30 cm. He wrote that this is one of five radio controlled models being built by the *Amsterdam Aeronautics Club* with the help of E. J. Lorenz's articles in M.A.N. Mr. Bosman stated that the advertisements in M.A.N. cause him and his fellow modelers to envy us our abundance of modeling materials.

No. 6 was sent in by Bill Griffin of 1429 Hemphil St., Fort Worth 4, Tex. The model is original and is powered by a McCoy. It is colored metallic blue and weighs 2½ lbs. It took first place in beauty and second in speed at the Mid-Winter Contest held in Fort Worth last December.

Winnett H. Dashiell, 708 Anneslie Rd., Baltimore 12, Md., sent in No. 7 showing his *Piper Cub Coupe*, which looks as though it needs a pair of skis!

No. 8 was sent in by Mrs. Gordon Snow, Geneva Park, Boulder, Colo., who is justly proud of this excellent model built by her husband. The model is made of balsa and is planked, then covered with aluminum foil. Nose, turrets and windows are made of plexiglass, moulded in the oven. The landing gears are retractable, and the model is complete down to a 10-man crew. Mrs. Snow certainly is a fine press agent!

Larry and Julius Rehfield make a fine working team, as evidenced by the model built and photographed by them in No. 9 position. These brothers, who live at 145-18 18th Ave., Whitestone, N.Y., call the model Triple Trouble or "The Height of Folly!" It was powered by an *Ohlsson 60* and two *Bantams*, but the *Bantams* were removed when three engines proved a little too much to handle. This model has been flown over 400 times, usually on 75' lines, although it has been flown on 130' lines with good results. The ship is silk covered and has a wingspan of 5'.

No. 10 sent in by Tage Nissvik, Köpmangatan 44, Orebro, Sweden, shows additional evidence of fine teamwork. The model was designed by Tage Nissvik, built by Per-Olov Lekare, and Albin Lindgren designed and built the engine which is a 2.4 cc diesel. Span of the model is 20".

Jerome C. Lewis, Publicity Chairman of *Brain Busters*, is shown in No. 11. Jerome, who lives at 8 E. S. Hampton Ave., Hampton, Va., wrote that he was privileged to use the NACA free flight tunnel while working on this model. He placed the wing far forward in order to insure ample directional stability. He used a generous amount of stab area for a stable flight under power, and for directional stability the center of lateral area was designed to come behind the CG. The large tail in turn damped out the pitching characteristic of the wing; hence two forces act against each other. Jerome used the R.S.G. 35 airfoil.

Eddie Campana, 29 London Street, Sault Ste. Marie, Ontario, Canada, sent in No. 12 of his original rubber model. He writes that this model was very successful and featured a rocket climb; the glide was also good considering it is a pylon job.

NEWS OF MODELERS

Edwin C. Woynoski, 326 Hanover Street, Nanticoke, Pa., is anxious to acquire the first 19 issues of MODEL AIRPLANE NEWS for his collection. Since these copies are to be bound into volumes, they must be clean and in good condition.

P. N. Dash, 104 Elmdale Crescent, Northfield, Birmingham 31, England, would like an American modeler pen-pal of about his age (17½) with whom he could exchange news and views.

Gordon W. Mayes, 139 Milton Street, Kingsley, Northampton, England, a 25-year-old modeler, desires to correspond with an American of his own age who is interested in exchanging magazines, photographs, plans, etc.

L. Rijsdijk wishes to correspond with an American boy who might be interested in exchanging photographs and magazines. He is particularly interested in securing issues of M.A.N. from 1940 to 1945 which he was unable to obtain during the occupation of Holland. Readers can contact him at Oostzeedijk 29a, Rotterdam-Oost, Holland.

Mario Poltronieri, 19, Via C. Goldoni, Milano, Italy, wants to trade a new, very good Italian diesel motor, Class B or C, for a corresponding American gas motor. He would also like to exchange correspondence, ideas, designs, and magazines with an American modeler.

Lim Chin Hua, 8 Kuching Lane, Penang, Malaya, writes that receipt of M.A.N. has increased his enthusiasm and that of his brother for modeling. Their 3 copies are already well worn since foreign monetary regulations make it impossible for them to subscribe now. The destruction of their property in Java made necessary their evacuation to Malaya, and they are unable to resume their hobby due to lack of materials, plans and magazines. However, we are sure their enthusiasm will make it possible for them to find a way to continue their modeling—they will certainly be most grateful to receive letters from more fortunate modelers.

Kelvin Duncan, 18 Charles Street, Linwood, Christchurch, N.Z., desires to correspond with an aeromodeller 14 to 16 years of age from North America, South America, or Africa. Kelvin informs us that balsa wood is easier to obtain in New Zealand but is triple the price advertised in M.A.N.

(*Turn to page 44*)

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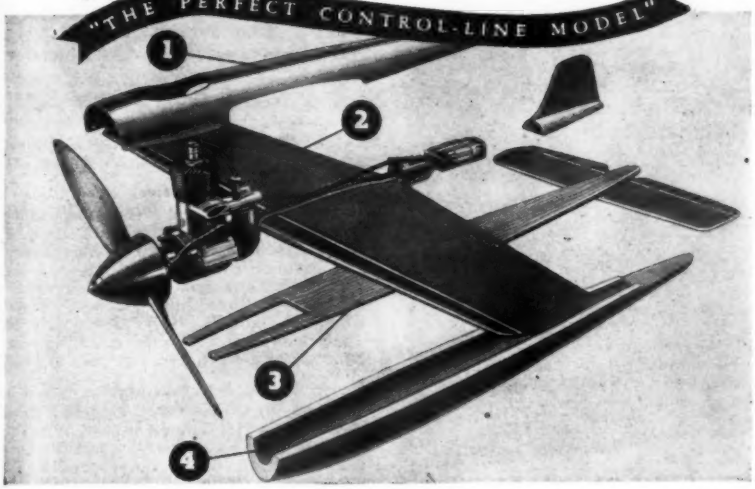

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Phil Heller, 754 N. 11 St., Allentown, Pa., wishes to correspond with modelers on the west coast, especially someone who has used Liquid Dynamite fuel.

CLUB NEWS

A nationwide contest for solid scale models is being sponsored by *Scholastic Magazine*. The contest will be carried on through the industrial arts and vocational teachers of schools all over the country. It is divided into two main classes: non-military aircraft, and miscellaneous models (boats, vehicles, houses, furniture, etc.). There are three age groups: Group I, students in grades 7, 8 and 9, whether in elementary, junior or general four year high school. Group II, students in grades 10, 11, 12 who receive instruction for less than 10 hours per week in Industrial Arts. Group III, students in the latter 3 grades receiving 10 hours or more in the field of work represented by their entry, and who are not regularly enrolled in Federally-aided vocational or technical classes. Official entry blank and all other information can be obtained from the industrial arts teacher in your own school.

* *

California

Tom Engelman's Clip Sheet from Grand Central Airport, Glendale, reported that the Bellflower Airport has installed a new 150' U-control circle in cooperation with *Bellflower Hi-Liners*.

* *

San Francisco Recreation Department announced the results of their February contest for handlaunched pushers in their bulletin, *The Third Dimension:*

Micro Division—1. Jack Ritner 2. Frank Pagano 3. Bill Openlander.
Junior Division—1. Larry Giordanengo 2. Aurilla Doerner 3. Jack Hillard.

* *

The *Aeroneer* reports that *The San Francisco Model Aero Club* will hold eliminations for the Northern California East-West Challenge team on May 18 in San Francisco. The Southern California team will meet the Northern team for the finals at Alameda June 15.

* *

East Bay Aeroneers Assoc. held an ROW contest Feb. 9. One flight was allowed, but bad weather stopped the contest at noon.

Class A—1. Volponi.
Class B—1. Don Foote 2. Bill Steese.
Class C—1. C. Hubbard 2. R. Watkins 3. B. Weldon.

The E.B.A.A. had planned to hold their Free Flight Contest June 22, but due to the many changes caused by the All Western Open contest, and the change of the Fresno Annual contest, *The E.B.A.A.* decided to hold their contest May 18.

* *

In connection with a Hobby and Model Show to be held June 4-8 at Oakland Armory, Oakland, model builders are invited to enter precision and speed control line events. Classes are: A, .001 to .30 disp.; B, .301 to .500; C, .501 to .650. Jr. and Sr. as well as team classes are scheduled. Models for all events must be entered at 59 Grand Ave. by May 24.

* *

First official meeting of the Southern California Model Aircraft Congress was held Feb. 17 at Griffith Manor, Glendale, with official representatives of 16 model clubs in Southern California participating in the election of these officers: Pres. John Gall; Vice Pres. Vernon Oldershaw; Sec.-Treas. Lee Galloway; Commissioner Al Allen.

* *

Fresno Gas Model Airplane Club published the free flight point standings in the March issue of *F.G.M.A.C. News:*

Class A—1. R. Mosier 2. F. Marshall 3. F. Mosier.
Class B—1. R. Beggs 2. M. Martin 3. V. Warner.
Class C—1. R. James 2. R. Mower 3. F. Mosier.
Juniors—1. R. Mosier 2. P. Oldershaw 3. F. Mosier.

* *

Listed below is the 1947 contest calendar taken from Feb. 24 issue of *Northern California Model News:*

April 13—Free Flight—Bakersfield
April 27—U-Control—San Rafael
May 4—Free Flight—Stockton
May 4—U-Control—Los Angeles
May 11—Free Flight—San Bernardino
May 25—Free Flight—Fresno
May 25—U-Control—San Francisco
June 8—Free Flight—Los Angeles
June 15—U-Control—Alameda
June 22—Free Flight—Oakland
June—U-Control—Alameda
July 4—U-Control—Petaluma
Aug.—U-Control—Palo Alto
Sept. 28—Free Flight—Oakland
Sept.—U-Control—San Francisco
Oct. 12—U-Control—Los Angeles
Oct. 19—U-Control—Albany
Nov.—U Control—Vallejo
Dec. 7—Free Flight—Los Angeles

* *

Oakland Cloud Dusters held Record Trials at Livermore Airport on January 26 with the following results:

Wakefields—1. Mike Demos 2. Manny Andrade 3. Charlie Pottol.
Fuselage, ROG Class "D"—1. Manny Andrade 2. Pete Demos.
Fuselage, ROG Class "C"—1. Gordie Peterson 2. Pete Demos.
Stick Model, HL, Class "C"—1. Gordie Peterson.
TL Gliders, Class "E"—1. Charlie Pottol 2. Manny Andrade.
TL Gliders, Class "D"—1. Manny Andrade.
TL Gliders, Class "C"—1. Manny Andrade 2. Gordie Peterson.
HL Gliders, Class "C"—1. Serge Milisich 2. Carl Rambo 3. Larry Parsons.
HL Gliders, Class "B"—1. Mike Demos 2. Gordie Peterson 3. Serge Milisich.

Connecticut

News came from Joe Kazakavage of the formation of a new AMA club, *Ansonia Aerial Cowboys*. This club, which started last September with 5 members now has 27. The officers are: Pres. Martin Pelatowski; Vice Pres. Joseph Sciegaj; Treas. Henry Kulikowski; Secy. Grover Bostic. They are holding a model exhibition the latter part of April and first part of May.

District of Columbia

On Sunday, May 18th, *Capitol Model Aeroneers* will hold their third annual invitation meet, sanctioned by AMA. John Davis, Club Secy., can be reached at 536 Shepherd St. N.W., Washington, D.C.

Florida

Jacksonville Model Airplane Club, sponsored by the City Recreation Department, will hold a final elimination in the state of Florida on July 26 and 27 before the date of the National Meet. This will also be an open invitational meet for anyone wishing to enter and will include all classes of flying in free flight and U-Control. The club boasts 60 active members who participate in free flight and U-control flying.

Illinois

Nap Air Villains will hold the Lou Clemens Memorial Contest on September 7 in Naperville. Events will include free flight gas (A, B, C), open rubber, and handlaunched glider. Interested modelers should contact Bob DeMar, 620 S. Webster St., Naperville.

* *

Taylorville Model Airplane Club and the local Loyal Order of Moose are sponsoring a Regional Model Airplane Contest at Christian County Fair Grounds, Taylorville on June 15. The contest will be for U-control models, and there will be

three events in speed and one in stunting. This contest is scheduled to be held annually.

Indiana

Anderson Johnnies will hold their 1947 contest on June 29. Interested modelers should contact Mrs. Glenna Williamson, Secy., 2637 Meridian St., Anderson. Regular business meetings are held at the local YMCA on 2nd and 4th Wednesdays. The 1947 officers are: Pres. Harold Tremps; Vice Pres. Harry Murphy, Jr.; Secy. Glenna Williamson; Treas. Alvin Jenkins.

Iowa

The 1947 Tallcorn State Model Airplane Meet to be held July 3 and 4 is expected to be even more outstanding in size and competition than last year. Wallace R. Blake, Director, can be contacted at 529 No. 3rd St., Marshalltown.

The American Legion Wasmer Post 241, the Le Mars Chamber of Commerce, and the *Le Mars Model Club* are sponsoring a Four State Contest to be held at Western Union College Flying Field at Le Mars on July 4, 5 and 6. Events include free flight, control line scale, control line speed, control line stunt, rubber, glider, radio control and jet. This contest is open to anyone in Iowa, Nebraska, Minnesota and South Dakota. For further details write: Frank Jenkins, Secy., *Le Mars Model Club*, 200 1st Ave. S.E., Le Mars, Iowa.

Kansas

Plane Tips, official publiciation of *The Wichita Planesmen*, reported a contest to be held June 1. All events will be in Junior, Senior, and Open categories.

• •

Al J. Hummel reports that the Wichita Y.M.C.A.-Kiwanis Club Annual Model Meet has been scheduled for June 28-29. Competition will be held in free flight and control line events in the Open, Senior and Junior age classes. Contestants in control line events may qualify for the Nationals through the Wichita Meet as this event has been ruled the Official State Meet for control line flying. It is hoped that the new control line flying field of the *Hy-Flyer Clubs* will be completed in time to use for this Meet. Eldon Wahl, director of control line events at the 1946 Nationals, has been approved as Contest Director. He will be assisted by Louis Shore, John Downing and Al Hummel, co-director of '46 Nationals. Correspondence relative to the Meet should be addressed to Al Hummel, c/o East Side Y.M.C.A., 4007 E. Kellogg, Wichita 9.

• •

From the *Mid States Model Aeronautical Assoc. News* came the following additions to the contest dates listed in the May issue of M.A.N::

May 18—American Legion Meet, O. F. Olson, 2122 N. 56th, Omaha, Nebr.

June 22—Jr. Chamber of Commerce, Rex Barrett, Jr., 1312 Paris Rd., Columbia, Mo.

June 22-23—Webster Groves Air Scouts, O. L. Elbring, 475 E. Lockwood, Webster Groves, Mo.

July 12-13—Chamber of Commerce, Leo Miller, c/o C. of C., Cedar Rapids, Iowa

July 13—Kansas City Sky Kings, 3rd Annual Meet, Fred New

Aug. 10—Kansas City, Missouri, "Pop" Schreiber

Aug. 31-Sept. 1—Kansas City, Missouri, "Pop" Schreiber

Massachusetts

News of the formation of the *Rubber Demons* comes from Bernard Rosenby of Malden. This new club uses rubber powered planes only; they plan to hold meets every two months.

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Minnesota

Slipstream, published by *Minneapolis Model Aero Club* and Recreation Dept. Board of Park Commissioners, reports that January 12, date of the *Minneapolis Model Aero Club's* Annual Winter Free Flight Meet, was one of the coldest and windiest days of the year. Results:

Class A Gas—1. Bob Sweger 2. Rolland Dexter.
Class C Gas—1. Bill Hammer 2. Wally Erickson 3. Stewart Acker.

New Jersey

Bill Paterson, Secy.-Treas. of *Vineland Aeronauts*, reports they will hold their annual contest June 22 (June 27 rain date) at the Millville Municipal Airport, Millville.

New York

Schenectady Aeroneers Model Airplane Club and the Schenectady Union-Star are sponsoring a Regional Model Air Derby June 29. The 8th annual event will be held at Schenectady County Airport. Scheduled events include a special beauty event for the best looking model entered (with the qualification that it pass 10 seconds of powered flight and 10 seconds glide), handlaunched gliders, towline gliders, handlaunched rubber stick, cabin rubber models ROG, Class A, B and C free flight, Class A, B and C control line speed, Class A, B and C control line stunt.

Pennsylvania

Greenwood Aero-Modelers are again active with these new officers: Pres. Adam Gronski Jr.; Vice Pres. Sylvester Rafalko; Secy. Donald Burns; Treas. Earl Beickler Jr. Meetings are held each Thursday at 7:30 p.m., and the club has secured permission to use the new Scranton-Wilkes-Barre Airport. New members are welcome, and interested modelers should contact the President at 3901 Birney Ave., Greenwood, Scranton 6.

Washington

Walla Walla Gas Bugs are sponsoring an AMA sanctioned meet to be held June 8 at Walla Walla. Events will include gas free flight, control line and rubber powered. Ed Mitchell, Publicity Chairman, can be contacted at 434 N. Sixth St., Walla Walla.

South Africa

Newsletter No. 5 of the *Rand Model Aeronautic Club*, 73 Wolmarans Street, Johannesburg, reports the establishment of the Milner Park Clubroom containing workshop facilities and a model airplane library. An Easter Show Exhibition was held March 31 to April 7 with sections for free flight gas, control line gas, rubber, non-flying models built up scale, solid scale, gliders, and experimental models.

Holland

We have been advised that the date of the Aero-Fair was changed to May 16 to 22. The location has also been changed to the grounds and buildings of the Netherlands Annual Fair, Croeselaan Utrecht.

New Zealand

Gordon S. Smith, Secy. of *New Plymouth Y.M.C.A. Model Flying Club*, reports that this club (formerly the *New Plymouth Model Flying Club*) was the most active one in the Taranaki Union of Model Flying Clubs during the war. Clubs in the Taranaki Union were the only ones during the war to hold regular meetings. Mr. Smith is also Honorary Secy. of the Union. Affiliation with the Y.M.C.A. has given this club the use of a spacious room to meet in for business and instructional meetings. A. J. Robinson is the Club Captain. The club met on February 22 for a big display in conjunction with the *New Plymouth Aero Club*.

Care and Feeding of Diesels

(*Continued from page* 31)

leading to slow speeds. We can assume that there is a practical speed limit at which a piston can travel. If it has a two inch stroke, let us assume it makes 5000 strokes a minute at maximum speed. Cut the stroke in half; it then travels half the distance, so we can make 10,000 strokes a minutes. Were it as simple as that I am sure we would have had diesels a long time ago. If we go back a ways, we will see that the long stroke is what got us the high temperature to fire the fuel. Now that we have a short stroke, we must do something else to raise the temperature of the fuel. It soon became evident that the answer was not to raise the fuel temperature but to lower the temperature of its firing point or the temperature at which it would ignite. The European diesel designers hit upon the technique of adding ether to the mixture to lower its flash point. We fail to understand why they did not completely dispense with the long stroke.

From the earliest Swiss *Dymo* diesel, the design progressed rapidly, and we find the fuel injected in much the same manner as it is in the two cycle engines with which we are familiar. It is important to remember that the short stroke high speed diesel was yet to come.

Our American designers, a very practical group, just couldn't see any reason for the long stroke and attendant low speeds. They cut down the stroke, improved the fuel technique, and made the diesel a fast turning engine. We haven't figures as to RPM, but all you have to do is look at the U-Control speed records falling prey to the new diesels.

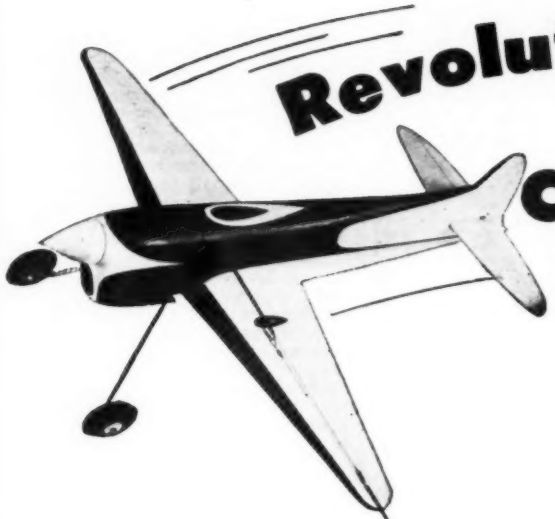
The American designs now on the market represent a high degree of perfection in diesel design. They are capable of holding their own on a displacement basis with an internal combustion engine. Suppose we look over an American diesel. Let's take the *Mite .099* as an example. Following engine operation cycle by cycle, here's what happens: with the piston down the intake through the shaft is closed. As the piston ascends for the first stroke, the fuel is drawn through the needle valve and into the crankcase. As the piston descends, our fuel and air mixture passes up through the cylinder bypasses. Then when the piston ascends, it shuts off the bypasses and compresses the charge in the cylinder until it explodes, driving the piston down again in the work stroke to start the cycle over again.

From what we have discussed it becomes obvious that the only thing that can stop a well made diesel from performing is fuel. We must have the right fuel to start with, and it must be correctly mixed with air to form the explosive mixture. Our fuel in most cases is an ether and oil mixture. Here we can make several mistakes.

The common grade is usually called simply "concentrated ether" and is the kind used in older days for starting autos. Next comes the "U.S.P." grade, which is a trifle more expensive, but will probably be available more widely. The highest grade is anaesthetic ether which costs twice as much as the others but is no better for engine use. Thus any of these three grades are useable; but the probability is that all of them won't be avail-

(*Turn to page* 48)

Revolutionary New CONTROL LINE FLYING



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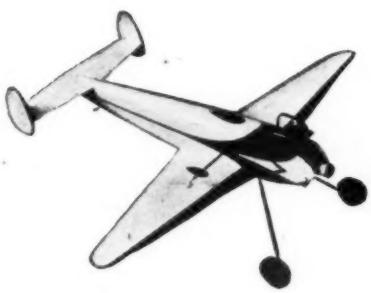

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Wing Span.....22½"	Fuselage is shaped and hollowed
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able to you so get what you can. You may hear reference to "sulphuric ether"; this is a somewhat outdated term that simply refers to the process of manufacture. Actually, all the three grades mentioned above are sulphuric ether.

With respect to oil, get the grade of oil that the instructions for your engine call for. Don't get any other grade. There are only a few things that you must do to assure success with your engine, so do them properly. If your engine manufacturer should recommend another mixture with different ingredients, be sure to follow instructions exactly.

One other precaution to be observed is the use of wax-free oils. It is very unlikely that you will run into any "wax" oils, but if you should they can wreak havoc on your motor. The wax in the oil causes the formation of a crust on top of the piston and this changes the compression ratio of the motor. Just as too low a ratio will cause trouble, so will an excessively high ratio. If allowed to build up too high it can readily blow the head off your engine. When buying oil to use as an ingredient in a diesel fuel, be sure to get *wax-free* oil.

Now that we have our fuel we're ready to run the engine. Here we must observe a few cautions. Your compression ignition engine is a very high compression motor. Should you accidentally get the cylinder too full of oil or fuel you're heading for trouble. Oil is virtually incompressible, and if the prop is flipped over sharply with a loaded cylinder, something is bound to give. It's apt to be the head or the connecting rod. If you think your engine might be loaded, flush out the cylinder with lighter fluid, ether, or gasoline. This small amount of care can save you considerable money.

Assuming the cylinder is clear and we are ready to start the motor, there is an old gasoline engine technique that works wonders on diesels: it's the head prime. A few drops of fuel shot into the exhaust port, a few sharp flips, and our engine is off. Here again caution is of great importance: *Your motor must run off each head prime!* If it fails to do so, you're apt to load the cylinder, and once again you're headed for trouble. There is very little chance that your engine will not run off the prime. If it doesn't, and if it has provisions for bleeding the crankcase, open the bleeder and flip the prop to blow out the excess fuel. Chances are that it will fire while you do this. If it does, close the bleeder and get ready to start the engine. If it doesn't fire, prime it again. Remember, when the engine fails to run off the prime, to flush out the cylinder as noted above.

Most of the time when we prime the motor she'll start right off if the needle valve is set right. If it isn't we'll have to adjust it, and here our former gasoline engine experience comes in handy. If the diesel acts like a rich gasoline motor, the mixture is really too lean. If it sounds like a lean gasoline motor, it's too rich—this admittedly sounds like double talk, but it's the best way to explain it.

If your diesel is your first model motor, a knocking sound is an indication of a lean motor and is a sign to open the needle valve. A motor which gives short fast spurts of power when flipped is too rich, and the needle valve should be closed. When adjusting the diesel, it pays to be a little more leisurely than with a gas engine; don't make wide adjustments. The mixture is relatively critical, and since you have no ignition problem you can afford to spend a little more time getting the mixture right.

When it comes to spinning the prop, one sharp flip will get you a lot more than several slow ones. Bear in mind that the rapidity with which the mixture is compressed controls the heat developed to fire it. Fast flips, more heat, better firing. The fast flip will also keep your finger out of the prop. This pays off because these tiny diesels can really kick.

Now we are almost ready to fly, but not quite. Our ground adjustment on gasoline engines was never quite right for flying. The diesel is even more critical on this matter. You must get the mixture as rich as the engine will take and not die out. After you have the engine running right on the ground, open up the needle valve and make the mixture very rich. If you have gotten the mixture set right, your engine will sound very sorry on the ground, but just wait 'til it gets moving.

In U-Control a diesel can give you a little additional trouble. I owe a lot to Bill Siedler and Walt Schroeder who tipped me off to some of these little eccentricities. If you have adjusted the engine poorly on the ground, don't bother to "whip" it—it won't do any good. A diesel engine should always be allowed to run as it sees fit. "Whipping" them to make them lean out as one does with a gasoline motor makes them worse. Just let them alone, and if you've adjusted them properly you'll have no trouble.

In addition to high speeds you can count on a diesel for consistency. Once you get going in U-Control with a diesel you'll clock off lap after lap at the same speed. The engines seem to settle into a set speed pattern and seldom fluctuate from it. As a typical example of this we can cite the case of the fellow who timed 28 laps, and no lap was measurably different in speed.

Diesels also have an amazing will to keep running. Cases of models jumping the dolly and taking off the prop are common. Once they get going you just can't stop them. This persistency has enabled me to run my *Mite* with a 12" Flo Torque HiBall prop. Once accidently started in my apartment, and with an inaccessible crankcase valve, my *Mite* with its 12 inch prop managed to neatly strip the buttons off my shirt, while I made frenzied attempts to stop my little lease-breaker.

We don't recommend that you fly a *Mite* with a 12 inch prop, or a *Drone* with a 16 inch prop, but you should give them work to do. A diesel runs much better when it is loaded to some extent. This makes a diesel a topnotch engine for race cars and boats too. I have tried everything from a 5 inch toothpick to a 12 inch prop on my *Mite*. I recommended an 8-8 prop for the *Mite*. For the *Drone* try a 10-10.

All in all, we heartily recommend diesels for all around flying. For those speed fans who can't see the diesel for sour apples, all we can say is try to hold on to *your* records, here come the diesels!

EDITOR'S NOTE: Jack Bayha is Director of the radio hobby program heard over FM Station WGHF in New York City. Jack's radio work brought him in contact with the designers of the new American diesel engines at the very beginning of their design. His Saturday afternoon program, "Meet The Model Builder," has presented a great deal of information on this new engine type, and this article is based on Jack's actual experiences with the motors and on the numerous hints presented by the engine designers on his program.

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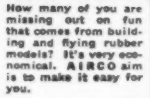

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14"—18c	15"—24c
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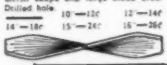

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The Monster

(*Continued from page 29*)

materially to the strength through skin stress. Dope ship two coats, allowing an hour's drying time between coats.

A one-bladed, folding prop, swinging a 16 to 17 inch diameter circle will pull the ship up nicely, driven by a motor of 28 strands of 1/8 flat rubber, 40 in. long and well lubricated. Prewinding pays off, so take time to break in your motors.

Don't forget to use bright colors on the plane to keep it in sight. If you can't get colored Silkspan, use white and put on colored Jap tissue decorations. Also, put on a return address sticker—it's easier than building a new ship.

Test glide by aiming ship at a spot on the ground 20 feet away and gently glide ship toward the spot. Too many modelers wreck too many ships by hurling the poor crates up into a gruesome stall. *The Monster* is balanced nicely, and only slight adjustments need be made on the stab and rudder trim tabs for a good glide.

Glide should be to the right. When glide is entirely satisfactory, wind in about 200 turns and hand launch straight out. If the ship stalls do not touch tabs; this is the error that almost all unsuccessful model builders fall into. Isn't it logical, if the glide is perfect, to leave glide adjustments alone? Work on power flight adjustment-thrust. Stalling under power can be taken out by adding downthrust or right thrust, or by a combination of both. By the same logic, failure to climb is usually traced to too much downthrust, or too tight a turn—so use common sense. There is no law that says your ship won't fly better on 26 or 30 strands; so use the old bean and experiment.

The motor should take at least 700 turns, and good stretching and winding will get you 800 to 900. Ship should fly in 200 foot circles to the right, both on power and glide.

The climb is fast and the glide quite slow with a tail-high altitude.

So let's go—that Bowl holds a lot of punch!

World War I

(*Continued from page 19*)

nover produced under contract only designs of other manufacturers, and in that time built about 550 Aviatik, Halberstadt and Rumpler types. In charge of engineering at Hannover was Hans Dorner, a pioneer in German aviation and a man to whom the "CL" specifications seemed to offer a challenge. His first design in that class, the Hannover CL.I, emerged from the Linden plant in the late summer of 1917, and the Flugzeugmeisterei knew it had one answer to its problem. As with all prototypes the Han CL.I, as it was officially designated, underwent some modifications and came out as the Han CL.II late in 1917. Production was begun immediately and it went on active service at the front in January 1918.

Hans Dorner's attempt to produce a light, self-defending .two seater resulted in a design that was highly unorthodox compared to any standards one might choose. It certainly wasn't typical of anything or anybody designwise, and through the inability of Allied observers to identify the Han CL.II it became an acknowledged "mystery ship" of the skies. Allied pilots who saw it were amazed at its curious biplane horizontal tail assem-

bly, deep fuselage and wide field of fire afforded by the low-set wings. They developed a healthy respect for it for no other reason than that the Han CL.II was nearly as fast as a scout plane and flew and maneuvered like one. Various reports of it reached the Allied press and its identity was the subject of much speculation. As though it were intended to be one of the best kept secrets of the war, it was not until March 1918 that an example of the type was brought down intact behind Allied lines for close examination and flight testing!

Meanwhile, various sketches had been made by both air and ground observers and published. The first clue to its identity was advanced in February 1918 when a Hannover was brought down in flames by a French fighter pilot, Lieut. Mussat. Inspection of the burned remains revealed only the initials "H. W." which to investigators meant either "Halberstadt Werke" or "Hannover Werke"; they weren't sure which. It was simply referred to as the "H. W." biplane. Oddly enough the Hannover enjoyed at least three months of action incognito, so to speak; probably a record to break all records in either war!

The bitter school of experience quickly changed the opinion of two seaters held by Allied airmen who attacked the early 1918 Hannovers single handed. Almost immediately the definition of "cold meat" was amended to include the phrase "...all two seaters, *except Hannover*..." Specifically, it took two good single seaters to lick one Hannover and those Allied pursuit pilots who thought otherwise invariably became eligible for the famous "sadder but wiser" club. Obviously, Hans Dorner had done a good job for his Fatherland.

Design and Construction

Records show that the biplane tail Hannover was built in four production models. Type CL.II, the mystery ship, was built in a quantity of 439 ships while 80 CL.III and 573 CL.IIIa types were constructed. A number of CL.II types were returned to the factory and modified, redidentified as CL.IIa. Models CL.II, CL.IIa and CL.III were powered by Argus AS III engines, a six-cylinder vertical water-cooled type developing 180 hp at 1400 rpm. Type CL.IIIa was powered by a standard Mercedes 160 hp engine. No doubt engines were eventually switched around in all models, but these powerplants were installed in the basic types mentioned.

These four types which gave the Allies so much trouble during 1918 were identical in configuration and differed only in interior fitments or minor external adornments. CL.II and CL.IIa were listed in official specifications as having an empty weight of 1110 kgs. and carried a useful load of 360 kgs. This load included complete camera and radio equipment in addition to regular armament, etc. Numerous radio fittings such as shelves, brackets, a lead weighted trailing antenna and reel, a dynamo and interior wiring made up part of the empty weight. Types CL.III and CL.IIIa specified an empty weight of 1074 kgs. and a useful load of 340 kgs. The weight reduction was achieved by installation of the lighter but less powerful Mercedes engine and elimination of radio and camera equipment as standard fittings. These articles were added in the field as requirements indicated.

Less powerful than standard "C" class contemporary types by about 100 hp and lighter by 500 to 1000 lbs., the Hannovers were designed by Dorner to give the

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1/16x1/4....6, 5c | 3/16x1*....3c ea.
1/16x3/8....5, 5c | 1/4x1/4*....3c ea.
1/16x1/2....5, 5c | 1/4x3/8*....2c ea.
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3/32x1/16....5, 5c | 1/4x3/4*....2, 5c
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3/32x3/8....4, 5c | 1/4x1½*....4c ea.
3/32x1/2....3, 5c | 1/16 sq.*....2, 5c
1/8x1/8*....5, 5c | 1/8x3/8*....3c ea.
1/8x3/16*....6, 5c | 1/8x1/2....4c ea.
1/8x1/4*....4, 5c | 1/8x3/4....5c ea.
1/8x3/8*....4, 5c | 1/8x1*....6c ea.
1/8x1/2*....4, 5c | 1/8x1½*....6c ea.
1/8x1*....3, 5c | 1/8x2*....7c ea.
5/32 sq.*....4, 5c | 3/16x3/8*....6c ea.
1/16 sq.*....4, 5c | 3/16x1/2*....6c ea.
3/16x1/4*....4, 5c | 3/16x1*....7c ea.

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1x3x6 7c | 3x3x6 19c | 11x11½x12 7c
2x2x2 3c | 3x6x6 40c | 1x11½x15 8c
2x2x6 5c | 4x4x4 27c | 11½x11½
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gunner-observer an opportunity to act offensively. He was placed high on top the fuselage to permit 360 degree firing over the upper wing, straight down on either side and toward the tail in unusually wide arcs. This wide field of fire combined with the pilot's synchronized gun made the Hannover a formidable opponent. Generous area balanced ailerons gave it the excellent lateral control so important in maneuvering with light single seaters. The big biplane elevators and the rudder provided the Hannover with unusual agility.

Smaller than most two seaters, the Hannovers spanned 39 ft. 2½ in. on the upper and 36 ft. 8½ in. on the lower wings. Respective chords were 5 ft. 10¾ in. and 4 ft. 3 in., giving a total wing area of 360 sq. ft. Incidence of the lower wing was 5½ deg. at the fuselage and 5 deg. at the struts; upper wings were 5 deg. throughout. Dihedral of the lower wing was 2.7 deg. and that of the upper wing 1.5 deg. Both wings were made up of two hollow wood spars fitted with plywood webbed ribs cut out to a continuous girder section, a spindle formed leading edge and wire trailing edge. Ailerons fitted in the upper wings were balanced, made of welded steel tubing and hinged to an aileron spar. Ailerons were washed out at the tips so a slight negative angle of incidence was provided compared to the upper wing.

Upper wings were attached directly to a rigid center section which contained the radiator and a small gravity fuel tank which was used for starting the engine. The center section was supported from the fuselage by an "N" shaped strut assembly on either side attached to lugs at the lower extremities and to ball and socket fittings at the upper ends. The struts were made of streamlined steel tubing welded into right- and left-hand units. Lower wings were attached directly to the bottom edge of the fuselage through stamped steel fittings bolted to the lower longerons. Spring loaded doors were provided in the lower wing to permit inspection of aileron control cables and pulleys.

Interplane struts were made of 1⅝ in. dia. steel tubing fitted with wood fairings and wrapped with fabric tape. The streamline thus formed was 4⅜ in. long and 1¾ in. wide. Strut ends were welded, tapered and drilled to fit sockets attached to the wing spars. Flying wires were stranded cables running from strut sockets of the upper wing to the bottom edge of the fuselage and anchored there to stamped steel clips which were screwed to the lower longerons. Right and left clips were riveted to a steel strap running underneath the fuselage. Landing wires ran from the uppermost center section strut fittings to clips at the lower interplane strut fittings. Drag wires from the lower interplane strut fittings to the nose and from center section strut sockets to landing forward lugs completed the bracing.

Fuselage

Four longerons and a series of bulkheads comprised the Hannover's basic fuselage structure. To this was tacked a series of square panels of three-ply veneer only 1/16 in. thick in the manner of the Albatros fighters. In the case of the Hannover, however, the fuselage was completely covered with doped fabric for added strength. Rectangular at the cockpits where it was 4 ft. 7 in. deep by 3 ft. 2 in. wide, the fuselage tapered through an oval section to a vertical knife edge at the tail approximately 16 in. high. Upper and lower vertical fins were built integrally with the fuselage and faired into it. The lower fin carried mountings for the tail skid.

The nose was finished off in a formed and louvered metal cowl which covered the engine in front and on both sides. The side cowls were attached to the fuselage structure by small spring loaded fasteners. The engine was mounted on "I" section bearers of ash and anchored to vertical brackets built into the fuselage. Landing gear struts were in the form of right- and left-hand "vees" of steel tubing faired with wood and wrapped with cloth tape. The one piece axle floated between front and rear spreader tubes and was sprung by coiled steel springs enclosed in a protecting fabric sleeve. Wheels were 760 x 100, fabric covered for streamline.

Use of steel coils as a substitute for rubber shock cord was common in Germany in 1918. Rubber was so scarce, in fact, that airplane wheels often were made of solid wood. Wood wheels were used for taxiing and were replaced by rubber tired wheels only for flight. One of the pictures printed here shows a Hannover with wooden wheels!

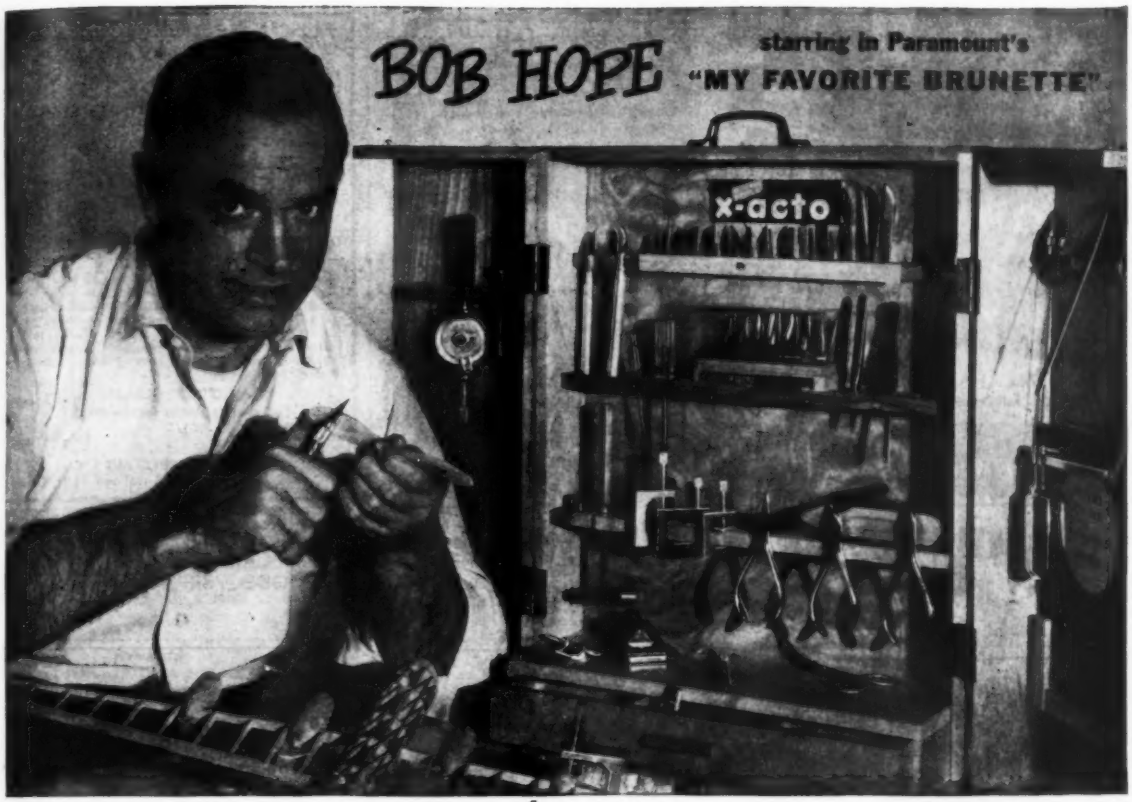
Cockpits for pilot and gunner were set high in the fuselage and close together to permit communication in flight. The gunner's pit was surrounded by a revolving ring to which a single Parabellum free-firing air-cooled machine gun was attached. He was provided with a small spring loaded seat set low in the cockpit which folded up automatically once he stood up for action. A cable operated sliding panel covered a camera well in the cockpit floor. He was also provided with a small writing board hinged to the back of the pilot's seat and numerous clips for maps, pencils and notes. On his right were a series of spring loaded pins which ran through the fuselage skin to grenade racks attached to the outside. By pulling these pins the grenades were permitted to fall free of the plane. In addition, the gunner was equipped with an extension to the hand air pump located in the pilot's cockpit for emergency use.

The main fuel tank of 30 gallons' capacity was located in the pilot's cockpit under his seat. On his left was a semi-rotary hand pump for the purpose of filling the wing gravity tank from the main tank. Air pressure obtained from an engine driven pump normally fed gasoline to the carburetor, but in case of an emergency, the pilot was provided with a hand air pump on his right. In addition to standard engine controls such as throttle, choke, spark advance, switch and starting magneto crank, the pilot's cockpit was fitted with a tachometer, compass, barometer and air pressure gauge. An anemometer type airspeed indicator was attached to the forward left-hand interplane strut and was graduated to 260 km/hr, approximately 161 mph.

Both cockpits were wired and equipped with plugs for heating purposes. Current was supplied by a dynamo located on the left side of the engine at the rear which could be brought into action by a driving pulley attached to the engine crankshaft and operated by a clutch controllable from the gunner's seat. This dynamo also provided current for radio operation. Conventional flight surface controls were provided for the pilot, including an auxiliary throttle control incorporated in the stick which could be operated independently of the usual throttle quadrant.

Probably the most unusual feature of the Hannover CL.II and CL.III types was the biplane tail assembly. The upper

(*Turn to page* 55)



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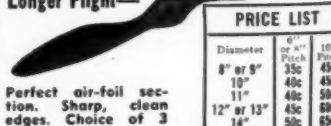

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stabilizer was mounted on top the vertical fin and was made of welded steel tubing, fabric covered. The lower stabilizing member carried a heavy symmetrical airfoil section and was made of a wood frame covered with 1/16 in. three-ply reinforced by a layer of fabric. Early production Hannover stabilizer units were braced by one interplane strut on each side and furnished with cross bracing wires. The upper stabilizer of such models was further braced by two sets of very short struts running across the angle formed by the junction of the vertical fin and the stabilizer. In later models, the structures were internally strengthened so the interplane strut and wire bracing were eliminated, but the rearmost short strut was made considerably longer. Both elevators and the rudder were framed in steel tubing, fabric covered and unbalanced. Elevators worked together through cranks attached to a compression tube which moved vertically inside the vertical fin structure. The rudder was operated by conventional means.

Hannover Performance

Considering its power loading, which varied around 14 lbs. per hp and wing loading of about 7 lbs. per sq. ft., the Hannover's sea level top speed of 105 mph was not at all bad for a light two seater. At 10,000 feet speed dropped to 96 mph. In seven minutes it climbed to 5000 ft.; in 18 minutes it reached 10,000. This performance at altitude may not seem too good on the surface, but remember the Hannovers were intended to be self-defending observation craft, and at low altitudes where observing was done they could hold their own with the best of the single seaters.

If speed and climb weren't their greatest assets, their ability to maneuver and shoot back at an opponent was. This was where the biplane tail came into usefulness. By splitting its area, a smaller blind spot was presented under which Allied fighters could hide. At the same time, the Hannover gunner had a smaller restriction to his field of fire.

The Hannovers were very light on the controls and were not tiring to fly. Lateral control was exceptionally good and their fine rate of roll surprised many a Spad and S.E.5 pilot. Directional control was quick and positive and the elevators were very effective except at low speeds. The Hannovers landed slowly, about 40 mph, with little ground roll. In the air they were typical of their period: tail heavy with the engine on and slightly nose heavy with power off. Because of torque they tended to turn left with power on. While the Hannovers could be spun purposely, they had little inclination to do so on their own. They stalled gently but with warning and either mushed straight ahead with power off or tended to spiral flatly to the left in a power-on stall.

The Hannover CL.II and CL.III will always remain aeronautical oddities because of their biplane tails, but to a certain group of young men about thirty years ago they were somewhat like a bad dream. They will tell you the Hannovers were pretty tough customers, real fighting airplanes. And they'll agree it took two good single seaters to lick one!

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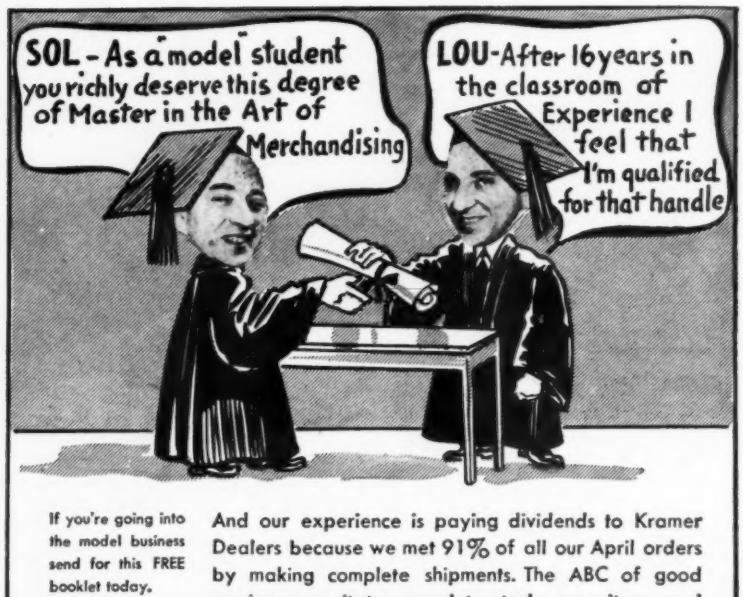

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Design Forum

(*Continued from page 41*)

where between the center of lift of these two wings. If the front wing is 1/3 the area of the rear wing and is placed at the same angle of incidence, then lift on the front wing will be just 1/3 the lift on the rear wing. The center of weight or CG (Fig. 2) will then be located between the two wings so that the distance X_1 is 1/3 of distance X_2. This is true from simple laws of mechanics which state, as applied to this case, that lift force of the front wing times its distance from CG must equal the lift force of the rear wing times its distance from CG: X_1, therefore, is 1/3 of X_2 because lift of A_1 is 1/3 of the lift of A_2.

This would be the case only if both wings have the same angle of incidence. However, to obtain any measure of longitudinal stability the front wing must be set at a greater angle than the rear wing, with a minimum difference between the two of 1-1/2°. Usually the front wing is set at an angle 2 to 2-1/2° greater than the rear wing. This setting provides sufficient stability without decreasing the efficiency of the wing combination.

Now with the front wing at greater angle than the rear wing, the front wing lifts more per square inch of surface than does the rear. The increased lift is about 1-1/2 times the lift of the front wing set at the same angle as the rear. We may say that the lift of the front wing, in proportion to the two areas, is 1-1/2 times the lift of the rear wing. This changes the position of CG relative to the two wings. To determine the correct position, the value of X_1 must be multiplied by 1-1/2. Then the relation is X_1 equals 1-1/2 and X_2 equals 3 or a proportion of 1 to 2, so the distance from the CG to the center of lift of the rear wing should be 1/2 the distance from the CG to the center of lift of the forward wing in order to have correct balance in flight.

Compare these conditions with those in Paul Audette's plane, Fig. 1. The CG is in correct position in respect to center of fuselage weight, but in the top view it is shown very close to the forward wing. Obviously the forward wing would have to do most of the lifting while the rear wing would be practically useless. The correct position for the wing is shown in Fig. 4. You will note that both wings have been moved forward so that the distance from CG to the rear wing is 1/2 the distance from CG to the front. This shift makes advisable other changes in the design. For instance, the cockpit should be moved forward. The fuselage may extend rearward as indicated, if desired, because with the rudder placed at its tip a large directional turning moment may be obtained. This moment is proportional to the distance of the rudder to CG. To be effective, the rudder must be back of the CG a distance equal to 1/3 to 1/2 the wingspan. Now we have a model that will be stable longitudinally.

The next problem is directional stability. If the front wing is placed low, as indicated on Audette's plan, Fig. 1, it would be comparatively unstable directionally; and if in this position on a full scale aircraft there would be no front wing after the first takeoff from the water, unless this wing was constructed so sturdily that it served as an aquaplane to facilitate water takeoffs as well as a front wing in flight. The front wing on all pushers should be placed well above the axis of the thrust line, Figs. 4 and 5. Let us see why.

When a pusher banks and starts to cir-

cle the nose has a tendency to slide inward and drop, so that if this continues without correction the plane dives into the ground. This turning takes place about the plane's vertical axis. In other words, the nose swings horizontally sideways. The problem is to rotate the plane out of the bank *before* the rotation sideways becomes extreme. If this can be done, the plane returns to level flight before the nose swings so far sideways that it points toward the ground. The whole problem of directional stability in a pusher hinges on this fact; namely, the plane must recover by rolling out of the bank about its longitudinal axis before displacement sideways about its directional axis becomes too great. The high front wing does just this because it provides area above the longitudinal rolling axis, so that when the nose slides sideways there is a pressure above this axis which tends to roll the airplane back to level flight.

The next requirement is the slant of the longitudinal rolling axis, Fig. 5. This axis passes through the centers of forward lateral area and rearward lateral area. For complete and quick recovery in a model, the forward end of this axis should be higher than the rear. In other words, it should slope upward relative to the thrust line. When the ship rolls about this upward slanted axis it rolls so that the nose is pointed up. The airplane will then climb normally. If the axis is sloped down, the plane will roll with the nose down, and it will dive toward the ground.

In the early days model builders had little concern for the slant of this rolling axis. They merely stuck two wings on top of the plane, put two propellers at the rear and let it go at that. These models were very stable when, without realizing the significance of their act, the model builders provided the front wing with large dihedral. By so doing they inadvertently provided side or lateral area above the thrust line in the nose. This in effect raised the forward end of the rolling axis.

If you have ever built a twin pusher you will know that none of them flew with proper stability unless the front wing had dihedral. Without dihedral the nose of a canard tends to slide first one way then the other, with only an occasional recovery. Most canards fly more steadily if a vertical fin is placed at the rear below the thrust line. The effect of this is to lower the rear end of the rolling axis, giving it more slant.

It also serves another important purpose. It helps to balance the side area of the front wing dihedral so that the total center of side area, CLA Fig. 5, is to the rear of the CG. This is the next and an exceedingly important requirement. Most modelers give little thought to this requirement and usually send in designs with the center of side area forward of CG. Such an airplane would act the same as a tractor with a fin in front and none at the rear. The effect would be to nose suddenly to the left or right without recovery.

Lateral stability on canards is obtained, as in tractors, by using dihedral. This may be used on both wings. However, the front wing should have much more dihedral than the rear. It is common practice to give the rear wing 6° to 10°. The smaller the dihedral that will satisfy stabilty the more efficient your wing will be. In most cases 6° is sufficient provided other factors are right. The front wing can be given as much as 30° on each wingtip, although the average is about

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20°. If the front wing is placed at a considerable distance above the thrust line, as little as 15° may be used, but not less. Strange to say, dihedral on the front wing not only provides lateral area and helps directional stability, but it is essential for complete longitudinal stability.

Perhaps you have seen a canard climb steeply and nearly stall, then dive sharply, losing valuable altitude before recovery. If the front wing had sufficient dihedral this never could have happened because, when a canard with large dihedral front wing approaches the stalling point the air speed becomes less, causing the air to spill off the tips of the forward wing, thereby reducing the lift gradually before the ship reaches the stalling point. This causes the nose to drop slightly as speed decreases and, instead of reacting sharply and diving, the nose drops gradually and the model sails gracefully into level flight or a glide. In fact, large dihedral on the front wing provides so much longitudinal stability and tendency to recover from stalls that the front wing may be set at a smaller incidence angle than would otherwise be the case. This reduces the difference in angle between front and rear wings and thereby increases the total aerodynamic efficiency of both wings. That is, the lift-drag ratio of the airplane is increased in level flight.

You will note that in Mr. Audette's design he provides a rudder at rear of the fuselage. This would be very ineffective because large directional turning moments are required in full scale canards. It is due to distribution of the weight over the length of the fuselage. This type of plane requires unusually large rudders even though they may be located far back of the CG. Much more effective results are obtained by using drag flaps at the wingtips. Opening these on the right wing causes a large drag on the right wingtip, which pulls the nose sharply around to the right. The reverse is true when the left drag flaps are open.

Mr. Audette shows his plane with jet motors at the wingtips. In this position they would not be any more effective from a propulsion standpoint but, on the other hand, would require heavier wing structure to support them. A lighter airplane and greater general efficiency would result if they were placed 2/3 of the half span outward from the body. This would keep bending moments in the wing structure to a minimum. However, the driving force would have to be carried through the wing to the fuselage. This would require a very strong horizontal truss. Because of these conditions it is the practice to locate engines fairly close in toward the body. They are usually placed so that the distance from body to engine is 1/4 to 1/3 the span of the half wing.

* *

Recently our readers seem to have become very jet motor conscious. They stick them on all sorts of designs and in all sorts of places without regard to their qualifications. Like all other things, jet motors have certain merits and certain disadvantages. Their outstanding characteristic is their efficiency at very high speeds, especially above the speed of sound (about 740 miles an hour). At low speeds they are very inefficient. Consequently, they are not well adapted to the personal airplane which usually does not fly over 200 miles per hour. (Most of them have a speed nearer 100). So, until some way has been found to make jet motors efficient at low speeds they cannot be adapted to the personal or sport plane.

(*Turn to page* 60)

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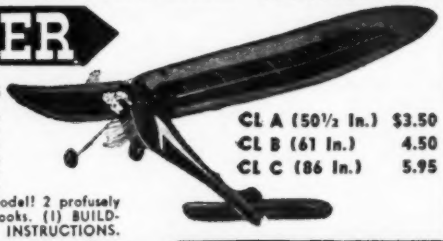

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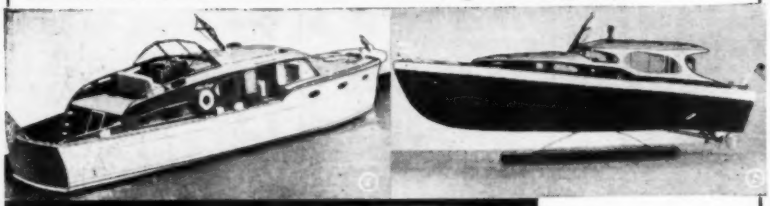

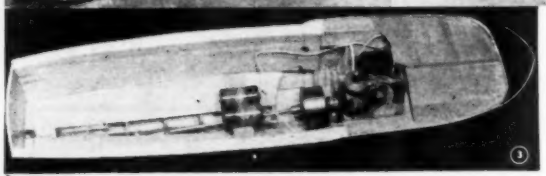

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It has always been a problem to know where to put the propeller when designing an airplane. If you arrange all the required features in the most convenient manner, you usually find you are stuck with the propeller. First you stick it on the nose and you feel your vision is impaired, so you take it off and attempt to put it at the rear; there it gets in the way of the rear part of the fuselage holding the tail. So you cut that off and use booms. This is not entirely satisfactory either because tail stresses make booms inconvenient. One has a tendency to bend up and the other down, causing a weaving motion to the wing; you try to stop this by bracing the wing strongly between the booms and the body. This can be done satisfactorily but up goes your weight. Possibly struts running from the wing at the boom down to the body will provide the required rigidity but here, instead of weight, you have drag or resistance. This amounts to the same thing in the end because 1 lb. of drag is equivalent to 12 or 15 lbs. of weight.

Some designers have solved the problem by extending the lower part of the fuselage to the rear beneath the propeller. However, this necessitates placing the engine and prop high enough to provide clearance between the prop and body. With the engine higher, greater frontal area is produced so again we have greater drag and loss of power. If we could only throw the propeller and engine out the nearest window, it would be a great blessing for designers. Therefore it is natural for young designers to look with admiration upon jet engines because they may be placed within the fuselage back of the passenger compartment, as shown in the design by Jack Whitaker, Fig. 6.

In fact, there is no hint of an engine at all in this airplane except the blunt jet outlet back of the stabilizer. The possibility of obtaining a clean, smooth and fast airplane like the one shown can almost make designers close their eyes to inefficiency of jet motors at low speeds. To a certain extent the clean lines of the airplane compensate for the low efficiency. Perhaps owners would not mind flying only 200 miles on a tank of gas instead of 300 to 350 because the shorter flight would be faster.

One other disadvantage of the jet motor is the heat generated. Special cooling devices must be installed. Whitaker has shown the jet and cooling intake on the lower side of the nose of his airplane. This may be convenient from a streamline standpoint but practically impossible if passengers are to occupy the cabin to the rear of it and over the jet passage running back to the motor. In this case the floor would have to be raised above the jet intake and the cabin made correspondingly deeper. It is better to locate the jet intake back of the cabin door. The sides of the fuselage can be bellied out slightly to provide openings to lead directly into the engine. Jet motors are unquestionably in their infancy and it is not unreasonable to assume that in the near future many of the present difficulties will be overcome; then the small sport plane will be a thing of real beauty and efficiency.

NOTICE: We wish to thank readers who have sent contributions and letters to "Design Forum." Hundreds have been received. Obviously it is impossible and impractical to answer each individually. Each month, therefore, we try to choose a discussion of points about which we receive the most contributions and questions. No slight is intended to readers whose names do not appear. Contributions for publication are chosen because of their unique features and practicability and the neatness with which they are presented. Do not forget to send your ideas in for future publication.

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Scorpion II

(*Continued from page 17*)

F-F before the top and bottom halves are tacked together preparatory to carving the outside shape. When the fuselage has been hollowed out, at no point should the wall thickness be less than 3/16ths.

2. Secure the motor-mount in the forward part of the upper portion, hereafter referred to as the "power unit," with plenty of cement. The *Chicago* screw is procurable at any good stationers; the female part is cemented securely into the rear section of the upper fuselage portion, hereafter referred to as the "empennage unit."

3. Make the hole in the lower half, at section B-B, just large enough to admit the cylinder head. Fit the helmet cowl around the cylinder according to section H-H. The sides of the cowl are built up first and the cylinder itself is used continuously to check for proper clearance. Crude but nevertheless conclusive tests have shown that this type of cowling keeps the engine much cooler than is possible by merely allowing the "pot" to stick out in the breeze; and the drag is certainly no greater with the method shown.

4. The completed wing and bellcrank assembly is let into and then cemented to the lower half. It is necessary to cut slots in the fuselage wide and deep enough to admit the wing spars. The slots are filled in and reinforced after assembly. Wing fillets are built up from tailored, soft 1/16" sheet and plastic wood.

5. The tail surfaces are cemented to the empennage unit. The tie-rod is fitted (and a drop of oil is applied to the elevator horn and tie-rod joint) before the entire empennage unit is permanently cemented to the lower half of the fuselage. The plan view of the ship shows the fin offset 1° left. It was found that at top speed—which was somewhat greater than anticipated—the line tension became rather high; this leads to the belief that offset (and even the fin itself) could be eliminated. However, in the interest of takeoffs and landings at reduced velocity, it is safer to leave things as they were first designed.

6. There are no particular comments on finishing except to say that a super finish is largely a means of realizing greater personal satisfaction in the degree of perfection. But it must be admitted, albeit with profound regret, that even the most beautiful gleaming finish looks like . . . at the end of a day's flying; what these hot fuels do to a slick paint job would make a strong man break down and cry like a baby.

A word about maintenance: the unretouched photos of the *Scorpion* were taken after some 200 seconds airborne time. During that period a wing was punctured in violent collision with the empty line reel carelessly left on the landing strip; two ground loops, due to an insecurely fitted takeoff dolly, played havoc with the finish and empennage; and of course the "hot soup" took its toll of the finish. Yet, because each disfigurement was patched or repaired without delay, the ship still looks very little the worse for wear. It pays to give a major overhaul, cleaning and new paint job after every 150 seconds flying time. This will maintain top efficiency; and because it is very rugged, the *Scorpion* will live to enjoy a long exciting life.

Notes on Performance

Due to a minor physical handicap, the writer is unable to pilot the really fast ships himself. However, those that have

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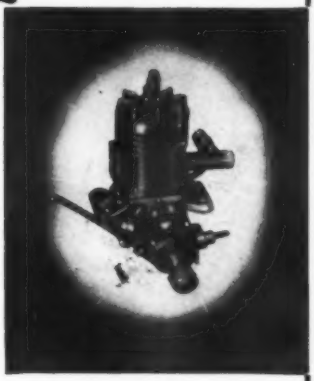

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4 Part 2 Stroke Cycle—
¾" Stroke—
15/16" Bore—
300-7000 R.P.M.—
Bearing Surface, 1¼" Long—
Crankshaft, 5/16" Diam.
Motor Weight, 10 oz.—
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Invertible—
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Runs 27 Minutes on One Ounce of Fuel
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Width, 2½"—
H.P. Approx. 1/5th—
Displacement, .517 cubic inches
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15. Easily inverted and runs in either direction.
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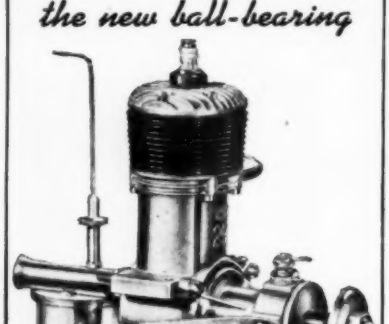

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flown the *Scorpion*, have been most enthusiastic about its handling qualities—some going so far as to swear that it's the sweetest thing on lines they have ever piloted. From outside the circle it certainly looks pretty good!

The following figures should be regarded as approximate only: Takeoff run, 20 ft.; stalling speed, 50 fps; max. speed, 135-160 fps; C.G. location, zero to 1/2" ahead of main spar. Actual performance data is governed by weight and power specifications of the individual ship.

The propeller, perhaps the most important design feature of any high speed model, should be selected only after long experiment. There is no space here to go into the complex procedure of prop design; the subject is worthy of an article by itself. Fortunately, most hobby stores can now supply a number of excellent commercial propellers, but to get top results even these must be considerably modified to suit your ship and motor.

150 MPH?

(*Continued from page 32*)

its way through the ground and your plane won't get off the ground at all. Let's make it unanimous—no more tailskids on speed ships!

Propellers have been tried with a longer diameter and narrow blades (to obtain lower tip angles). These were unsuccessful, however; the blades flew off while testing. Metal blades would make this improvement possible, but they have been outlawed because they could easily cut off a finger.

Using Don Newberger's propeller as an empirical criterion, the formulas of propeller design which follow were checked and found to give reliable results. The value of 25% allowed for slip proved to be about right. Again, it should be emphasized that the correct area and pitch were found by *many* flight tests of an *individual* model with a *particular* powerplant. The fine results obtained with Don's propeller design were only possible when used with an equally fine plane design. The Class C *White Comet* is an exceptionally streamlined design with a cowled, upright engine, very slender fuselage of circular crossection, a 2" diameter spinner, 24" span, and 26" length. He uses a moderately thick airfoil; the model has landing skids only.

If you are going to design a propeller starting from scratch, you'll have to guess it or obtain a fairly accurate value for your engine's most efficient operating rpm. If your engine doesn't turn a sufficient number of rpm your model will fly slowly—or perhaps not at all.

Let us say you have a Class C *McCoy* engine that can turn over at about 14,000 rpm and you wish to obtain a speed of 135 mph. To find the correct pitch for your propeller, solve the following formula:

$$\text{Pitch} = \frac{(S + 33\% \text{ of } S)\ FI}{MR}$$

$$\text{or....} P = \frac{1.33SFI}{MR}$$

where P = Pitch in inches
S = Forward speed in miles per hour
F = Number of feet in a mile (5280)
I = Number of inches in a foot
M = Minutes in an hour
R = Revolutions per minute

From actual results (empirical) we know that Newberger's model flew 134 mph; and measuring his propeller we

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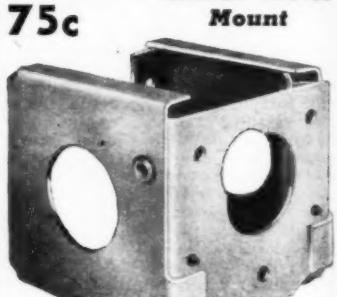

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found the pitch to be 13.5". We can find a reasonably accurate value for the rpm by solving the formula—

$$RPM = \frac{1.33SFI}{MP}$$

$$\text{or....}RPM = \frac{(1.33)\ (134)\ (5280)\ (12)}{(60)\ (13.5)}$$

$$RPM = 13{,}930$$

If the pitch and rpm are chosen arbitrarily, the speed which may be expected is found from:

$$\text{Speed} = \frac{\text{(P-25\% of P) RM}}{FI}$$

$$\text{or....}S = \frac{.75PRM}{FI}$$

Inserting 13,930 for the rpm, and 13.5" for the pitch, we get:

$$\text{Speed (mph)} = \frac{(.75)\ (13.5)\ (13{,}930)\ (60)}{(5{,}280)\ (12)}$$

Speed = 133.9 mph (slide rule accuracy)

If Don had used these formulas to design his propeller he would have had to *guess* that his engine would run best at about 14,000 rpm. He would have been unable to estimate the rpm any closer (to the accurate figure—13,930). Even so, he could find a fairly accurate value for the pitch, knowing the speed he wished to attain and guessing at the probable rpm. This may be seen from:

$$\text{Pitch} = \frac{(1.33)\ (134)\ (5280)\ (12)}{(60)\ (14000)}$$

$$P = 13.44"$$

This is only slightly less than the true value for P found empirically, shown below:

$$\text{Pitch} = \frac{(1.33)\ (134)\ (5280)\ (12)}{(60)\ (13930)}$$

$$P = 13.5"$$

One way to approach the problem of obtaining the *right* prop for a model you have built is as follows:

(1) Carve a prop of some reasonable pitch value with a little more area than can actually be used.

(2) Since for one pitch a propeller has a certain optimum (most efficient) value for the area, the trick is to slowly whittle down the area until your model records its fastest speed.

(3) As you cut down the area, the performance should improve—up to a point. When it hits peak and starts downhill again, you will know that you have cut away a little too much area. You can't "glue" that small amount of area on again, so you must carve a new prop—this time much closer to the *ideal* design.

(4) In the same way you can experiment with propellers of higher pitch. One method might be to carve several props, each one with an inch longer pitch. When the optimum area is found for each one (through flight tests) notice which one gave the greatest speed. If the one with the longest pitch gave the greatest speed you'll know that further experiments should be made with pitches of even greater value. If however the best speed is attained with one of the intermediate pitches, you'll know that you're getting close to the best value. Then you can carve new props with a fraction of an inch more pitch (or less) to find the optimum pitch value for your particular model.

(5) In carving down the area of the propeller blades, be careful not to change

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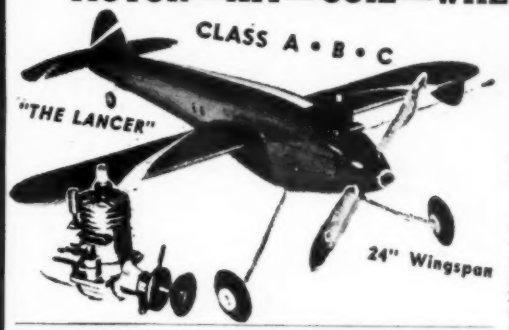

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the angles along the blade. One of those chiefly responsible for the present high speeds, Keith Goodwin of Vultee, uses templates to check the blade angles.

To obtain the different angles for the various blade elements (or stations) draw an "L" near the borders of an ordinary 8-1/2" x 11" sheet of paper. Along the long leg of the L lay out the circumference (πD or 3.14 x D) to 1/5 scale. On the other leg, measure off the pitch to 1/5 scale. The values are divided by 5 before being transferred to the drawing because *angles* are what we are seeking—and they do not vary with a change in the scale of the drawing. In short, there is no reason to waste paper drawing the sides of the L full size.

Divide the circumference into 8 parts. Extend lines from each of these points to the extreme end of the pitch line. You then consider these to be the angles of the blade at each 1/8 part of the propeller radius.

Using the conventional simplified block layout, carve the blades to the correct angles and then trim to the finished shape of a pattern. On the front face of the prop layout, draw in the finished blade shape. If you want the widest part near the hub, draw it that way; if you want it near the tip, there is no objection. With your dividers take the width of the blade at each station, lay it off as an offset type dimension on the angle layout; then transfer the resulting depth measurement to the side view of the prop layout. Repeating this procedure at each station will give you a series of dots which, when connected with a smooth line, will complete the side view of the blade shape. Of course you'll remember to center these width and depth measurements on a centerline drawn the length of both the front face and the side surface of the block.

All that remains to be done is to plot the cuts on the rough block. Usually the outer portion of the front face of the blade is of uniform width. Some builders just divide the radius in half. On the outer portion it is necessary to plot points on the side of the block. In the inner portion of the block the trim points are plotted on the front face of the block. Note where the blade angles cross the block's full width. Depth measurements are then taken with dividers on the full width line and centered on the side of the block. Using a compass draw in the basic lines of the hub, fair smoothly into the blade shape, cut out the block on the trim lines, and carve the blades to shape, beginning with the back surface.

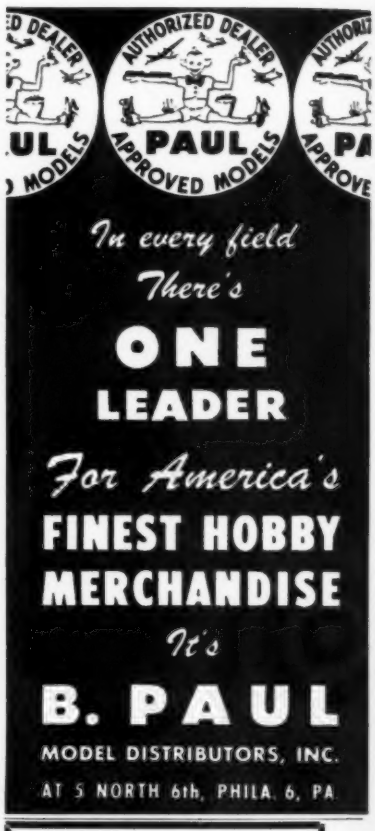
On propeller blades with thick airfoil sections it is necessary to alter the trim lines to allow for the airfoil thickness. In the new racing props little if any need be added because the blade thickness almost to the hub does not exceed 1/16".

Familiarize yourself with the procedure described here; carve many props and put them through the tests outlined. Then you will be able to beat the existing records of 134.42 mph, Class C, and 116.07 mph for Class B.

CORRECT PROPELLER DESIGN SUMMARY

1. Carve propellers of several different pitches; (for example: 8", 10", 12", 14", 16", and 18" pitches).

2. Find the correct area for each propeller (by the trimming method described in the article) and then see which prop gives the highest speed. If the best props are 12" and 14" pitch, try 13". If the best speed was obtained with an 18" pitch try 20".



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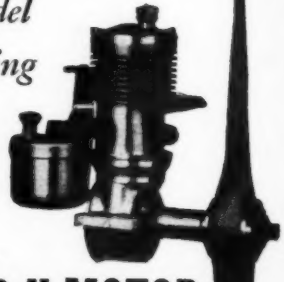

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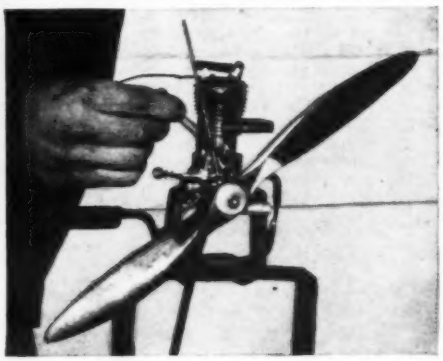

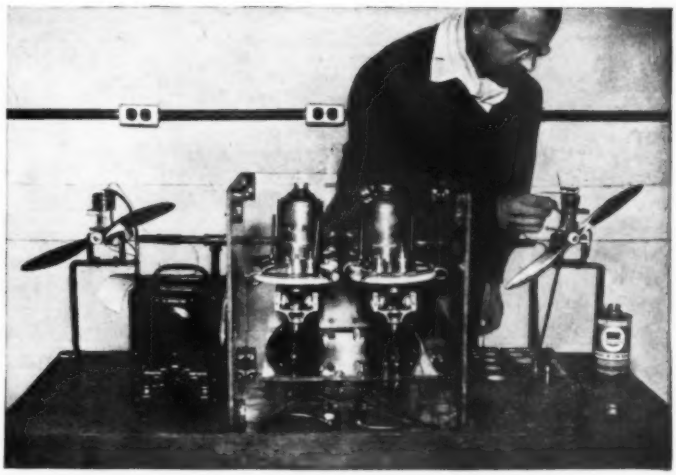

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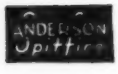

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Model Airplane Course for Beginners

(*Continued from page 27*)

pencilled outline. The only care necessary at this point is to avoid taking too large a shaving with your knife and thereby cutting wood inside the outline. To prevent this, whittle away the excess balsa *almost* to the outline and then *sandpaper* until the line is reached.

When this is done, note by referring to the front view drawing that the fuselage sides must be curved to form a point at top and bottom edge of the fuselage. This is done by sandpapering the fuselage to the required crossection shape with the 2/0 paper. Make certain, however, that a 1/8" wide flat surface is left on the fuselage top at the points where contact with the wing and stabilizer are to be made. These will act as platforms for the surfaces and will simplify the assembly operation. See Fig. 8.

In sandpapering, the work can be speeded by using a flat block of wood instead of your fingertips to back the sandpaper. This permits greater pressure to be applied on the paper and also increases the area covered by each stroke.

Tail Surfaces. With the fuselage completed, cut the rudder and stabilizer out of the 1/16" sheet balsa onto which we have already drawn the outlines. This is done with a razor blade as follows: insert the blade end or tip into the sheet balsa close to the pencilled outline and draw the blade the full length of each line. Use sandpaper to finish off each cut to the pencilled line, and then to round the edges top and bottom.

Wing. Having transferred the outline of the wing panels from the plans to the 1/8" sheet balsa, we proceed to cut out each panel. By referring to the first frame in the "film strip" you will note that this is done in a manner similar to that of the tail surfaces. A ruler or straight edge may be used as guide for the razor blade when cutting the long straight lines of the "leading" (front) and "trailing" (rear) edges. When both panels have been cut away from the balsa sheet, remove the excess material on the top surface of each panel with the aid of your sandpaper block, shaping it as indicated

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FIG. 9

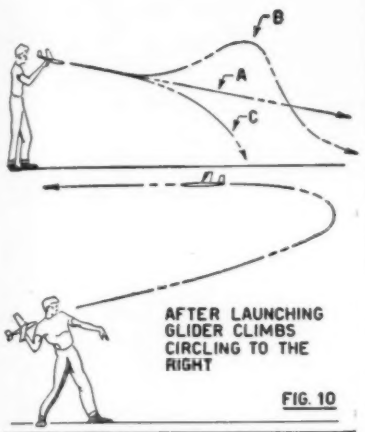

FIG. 10

in the typical wing section diagram on the full size plans. (See second frame of "film strip" for this operation.)

In addition to forming a curved surface on the top side of the wing, as indicated in the front view drawing, the panel must be tapered or "thinned out" toward the wingtip. The underside of each panel is also curved so as to round off the leading edge of the wing. By forming a clean curved section, the "lift" of the wing is considerably increased, and the air resistance or "drag" is reduced. This curvature is known as "camber." By changing the wing camber, it is possible to alter the lift and drag characteristics of a wing or airfoil section, and to change the model's flight performance.

To complete our wing, the two panels must be cemented together in such a manner as to form a predetermined "dihedral." (Dihedral is the amount each wingtip is raised above the horizontal.) To do this, each wingtip must be raised 2-3/4" above the "root" or inward section. Using the sandpaper block, sand the root section of each panel, forming a vertical contact surface when the wingtips are in the elevated position.

Assembling. Look at the bottom frame of the film strip and note that a piece of wax paper is placed under the wing when the two panels are cemented together, and that the proper tip rise is maintained by blocks placed under each panel while the cement is drying; this paper is used to prevent the wing from sticking to the surface on which it rests as the cement hardens.

While waiting for the cement on the wings to set, cement the stabilizer to the aft end of the fuselage; then cement the rudder into position atop the stabilizer.

The final operation calls for cementing the completed wing to the fuselage as indicated in Fig. 8 and in the full size plans.

In assembling our glider it is important to exercise patience and to restrain from "rushing through" with this work. Care must be taken to assure proper alignment of the various parts as they are cemented together, and sufficient time must be allowed for the cement to harden thoroughly before the assembly is disturbed.

Balancing. After the model is completed, our problem is to achieve proper balance and adjustment necessary for good flying.

The approximate point of balance for the completed model is indicated by the heavy arrow just aft of midpoint on the wing root in the side view drawing. Check this on your model by holding the craft

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loosely between thumb and index finger, allowing the undersurface of the wings to rest atop your fingernails. If the craft balances approximately as shown, you are ready for flight test. Should further balancing be necessary, this is best accomplished by applying modeling clay to the nose if the ship is tail heavy (balance point aft of the indicated position); or by further sandpapering the nose end of the fuselage if nose heavy (point of balance forward of indicated arrow).

Flying. The flight site should be a school gym or armory, or any other large indoor area that is free from obstructions. After giving your craft a last minute inspection to be sure all surfaces are properly aligned, hold it between your thumb and index finger at about the point of balance. Raise the glider to eye level and gently throw it forward into the air, making certain the nose is pointed slightly down and the wingtips are level.

If the craft is in perfect flight adjustment it will glide gently down following path A in Fig. 9. Should it follow path B and climb sharply, only to fall off into a dive, one of two reasons may be causing this behavior: (1) the craft may have been thrown too hard or fast; (2) it may be tail heavy. To eliminate (1), several more attempts should be made at launching the glider gently. If the same flight behavior persists, the trouble is most likely (2), tail heaviness—additional modeling clay should be used to weigh down the nose. However, if the flight path is not as erratic as illustrated, the craft may be made to follow flight path A by merely warping down the trailing edge of the stabilizer out towards the tips. Warpage of the surfaces is achieved by vigorously rubbing the balsa wood with your fingers to warm it, then gently curving it in the desired direction. Another method is to hold the surface to be warped close to your lips and breathe on it. The combination of heat and moisture thus absorbed by the wood makes it sufficiently flexible for curving.

If the glider follows path C after it is correctly launched, diving into the ground, the point of balance is too far forward, making the craft nose heavy. To correct this, weight must be eliminated from the nose, or the trailing edge of the stabilizer must be warped up.

Although proper adjustment for flying may prove tricky at first, this can soon be mastered by constant experimentation. Care must be used however, to check both alignment and adjustment of the surfaces *before each flight.*

After the glider has been adjusted, to achieve flights of longer duration the craft must be launched more vigorously, and at an upward angle—generally about 30° for best results. To prevent the glider from "looping" because of the force with which it is launched to achieve altitude, the craft is "banked" or tilted slightly to the right (Fig. 10) as it is thrown. This causes the craft not only to climb but to circle to the right at its peak altitude and then continue on a level flight path.

If the model is being thrown by a left handed person, the glider should be tilted to the left so as to execute a left circle.

Should the craft not fly a level course at the peak of its climb but dive earthward regardless of the stabilizer adjustment, this is corrected by warping the rudder to correspond with the circle or turn. That is—to the right if a right turn is being made, and to the left for a left turn.

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(*Turn to page* 72)

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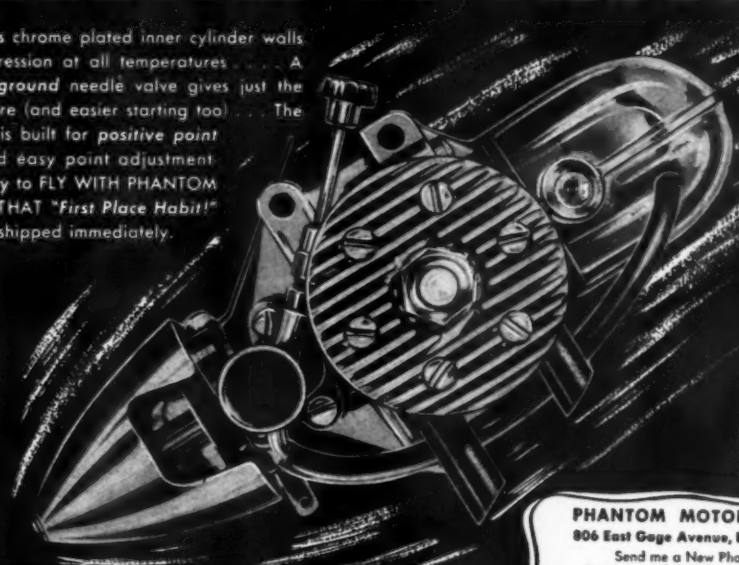

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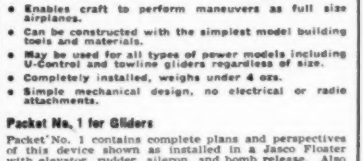

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longer lifespan of the model, in addition to affording invaluable experience which will be put to further use when we build a *rubber powered stick model* as our *third* project in this construction course.

• •

And now before "checking out," let's look at some of the questions submitted by our Course mates and attempt to answer them.

The first question is submitted by William Mills of Frederick, Md., who asks:

QUESTION: Assuming balsa is not available for flying model construction, what other wood can best be substituted?

Answer: Keeping in mind that the average weight of balsa is between 7 and 8 lbs. per cu. ft., the selection of a substitute must be made on a strength-weight basis. Engineering data shows that basswood, with a weight of about 26 lbs. per cu. ft., is probably the most practical substitute. When using basswood, it should be 1/3 the crossection of balsa strip, and about 1/2 the thickness of balsa sheets.

Desmond Rehm of Pleasant Garden, N.C., asks:

QUESTION: What is the meaning of the term ROG?

Answer: The letters ROG are an abbreviation for "Rise Off Ground" and applies to such models as are capable of taking off the ground under their own power. Generally, however, this term has been associated with stick type models such as we will describe in our third lesson next month.

Keith R. Pinsard of Pittsburgh, Pa., asks:

QUESTION: What is the true meaning of "streamline"?

Answer: The technical definition is: "The instantaneous path of a fluid particle." In common terms, to streamline means to shape the given object in such a manner as to maintain a steady and unbroken flow of fluid particles (or air) around said body, thereby reducing the resistance of the body and achieving greater speed.

Halberstadt D1

(*Continued from page* 39)

Begin assembling by gluing the lower wings into position. Mount all the struts which are made from 1/16" diam. dowel, covered with flattened soda straws, and slip the upper wing on. Don't be afraid to use the glue as it must be strong. Put in the flying wires and note from the plans that they cross over; that is, one wire goes from lower front to upper rear and so forth. Glue the elevator on, and slip the rudder post through the notch, adding the braces, top and bottom.

Put on the details—exhaust, M.G.s, etc. —and add the insignia (Iron Crosses were being used at that time). Mount the prop, and put in 6 strands of 3/16" flat rubber or equivalent.

Take the ship out on a calm day, in tall grass if possible, and test glide it. Make any adjustments necessary, wind the rubber a few turns, and try a powered flight. We found that we had to add a little weight to the nose, which gave a good, flat glide. The ship is very stable.

The model, by the way, is on the exact scale of 3/4 of an inch to the foot, with the exception of the tail surfaces which had to be enlarged a bit to give good flight characteristics, and of course the enlarged flying propeller.

Pulse Rate Control

(*Continued from page 21*)

ground to an oval shape to form a cam. Then a bakelite strip was hinged and held against this cam by a spring. A contact with flexible connection was affixed to the center of the strip on the same face that rides the cam. A coarse-thread screw with a contact on the end was held by a bracket so that it could be screwed against this contact. When the screw is backed off, the bakelite strip rides the cam and the contacts never touch. If the screw is turned in far enough it pushes the bakelite strip completely away from the cam, and the contacts make all the time. When the screw is half way the contacts make half the time and the cam holds them apart half the time; this is neutral. It required two turns of the knob to change from one extreme to the other. These contacts operate the keying relay in the transmitter through a convenient length of cord to the car where the transmitter is mounted.

When this arrangement was installed in the model a few trials showed a couple of defects. First, the rudder did not return to neutral when the control was centered. Next, even when you thought you had the control in neutral, the rudder would gradually creep to one side or the other due to irregularities of the contacts. It was decided that this defect should be corrected before making any flights.

In the meantime one of my buddies had built up a ship with escapement control and decided to adapt the equipment just described to his plane in place of his escapement. This experience proved quite interesting so let me tell you something of it. My fellow worker was William S. Howard of Atlanta, Ga. He, like so many others, decided to build a ship large enough to carry anything he could imagine, so it was a 12 footer with a big *Forster* motor. It had beautiful flight characteristics (so long as the CG was in its proper place); several flights were made with the escapement control, sometimes ending back on the field and sometimes two or three miles away in a tree. The model was quite slow although its weight seemed terrific compared to the usual size model; and once you got downwind it took up a lot of altitude to make any headway back against the wind. In addition to being slow flying upwind it is confusing to control a model when it is coming toward you since left-stick causes the model to go to your right, and vice versa. It is natural to make this mistake a few times at first or, when you get excited, even later.

With the wind against you and needing every foot of that altitude to get back to the field, excitement is at fever pitch. As you know, a model will change its course now and then with fixed rudder; therefore it requires constant vigilance to follow a fairly straight path. With short bursts of full rudder from an escapement to correct any tendency to stray from the straight and narrow path, any wrong rudder is disastrous; even if for just a moment. The plane makes a 180° turn, and if you allow it to continue to a full 360° to get headed back again the way you want it, you will probably find that it lost too much altitude in the turn to make the field. Another good flight gone wrong, and maybe the ship is finished for the day.

After several such experiences with the escapements, William and I worked most of one Saturday night changing over the control to use a geared motor instead. There had been 6 large flashlight cells mounted against the back of the engine firewall. These operated the escapement, and when we changed to the motor it was found that less voltage was required. Two cells ran it about right, so 4 were removed.

Sunday morning everything was ready. A good crowd was at our model flying site waiting to enjoy the regular Sunday display of busted free flighters when we arrived. After half an hour of testing, everything was all set. With escapement control William had always set the rudder to neutral, run the wing for the takeoff, and then run back to his control on the fender of the car. Today he decided someone should

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hold the control to correct for any tendency it had to creep while he ran the wing.

The takeoff was accomplished in a third the usual run and the plane nosed up immediately and went into a stall at 20 ft. The torque then took over and turned the plane left; naturally the fellow with the control gave her full right rudder, which did not take hold immediately due to the stalled condition. The nose gradually dropped off to the left and down she came in a screaming dive headed right back toward the takeoff point. All this time William stood frozen to the spot. Goggle-eyed and with mouth wide open he stared at the diving menace, all the while groping behind to take the control from the fellow who was holding it toward him fully 20 ft. away. As the ship gathered speed the full right rudder took effect, and at the bottom of the dive she suddenly changed direction, only 6 inches off the ground and about the same distance from William. As the plane zoomed up again the control exchanged hands and was given a quick twist to the left. The second zoom was much steeper and higher than the first.

She now had full left rudder helping the torque, so a complete wing over resulted and again down it screamed in a vertical dive, this time straight for the crowd. You never saw such excitement, repeated over and over again. Each dive seemed to pick a new intended victim, only to veer off to the right at the last possible moment and zoom up in a new direction and each time a little altitude was gained. After about ten such dives it was well above the field and folks began to enjoy the show. The final zoom was just beyond the trees on the horizon; then William turned to me and said: "Four batteries!" The extra power would enable more rapid operation of the rudder and possibly obviate such antics on the next flight.

During the next two weeks a new sort of an electric motor of the type still in use by the writer took shape. This motor does not run in the usual sense but makes something less than 180° of a turn with one polarity of battery, and turns back the same amount with reversed polarity. A short arm is soldered to the shaft to actuate the push-pull wire to the control horn on the rudder. Stops are provided on the end of the actuator (motor) shaft to prevent its making more than half a turn from one extreme to the other. The length of the control horn is adjusted for the desired rudder effect. Adjust so that the movement is small for the first flight; then gradually increase the rudder travel each flight until the desirable limit is found. Certain arrangements of LA and CG don't permit much rudder movement or the model will go into a spin (see some of Chas. Grant's articles on stability).

The actuator is really a two pole, permanent magnet field type electric motor without a commutator. For a more detailed description see drawings. The first one made weighed 8/10 of an ounce and had more power than was needed for the 5-1/4 lb. model; two medium sized cells were used, one for left and one for right, wired through the down and up contacts respectively of the radio relay. See diagram.

When building these actuators don't try to save too much weight by using very thin iron. This causes a serious loss of the number of degrees over which the actuator has a respectable amount of torque. A solenoid-type actuator would give the same operation to the controls, but they are notoriously inefficient. They require many times the amount of wattage from the batteries to accomplish the same work, besides weighing more themselves. Remember when building the actuator, magnetic force decreases inversely as square of the air gap.

The magnet used in the actuator at left of Fig. 2 is an alnico bar. For the smaller unit at the right of this illustration, two alnico magnets taken from the bases of the small plastic novelty dogs were utilized. These were soldered edgewise to the shaft, then were ground to the disc shape shown.

Ordinary soft iron does fairly well for the pole pieces and frames of these units. The main thing is to be sure the iron used will not retain magnetism.

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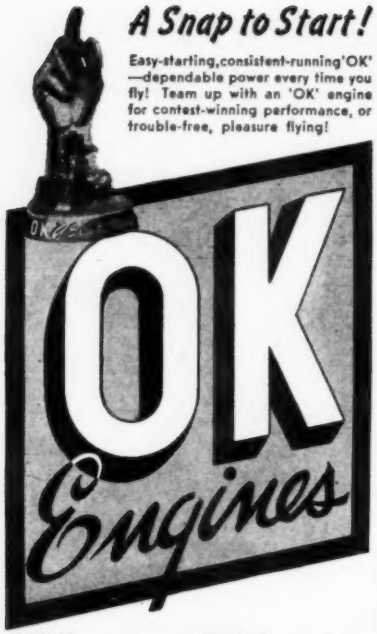

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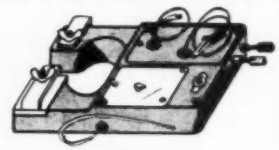

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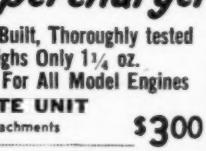

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S.T. had been ready for some time so into it went the equipment. The first trial resulted in a ground loop on the take off, ending up in a low branch of a nearby pine tree. The ship had a lot of fancy work on it such as turn buckles in the wires, welded up aluminum and steel landing gear with shocks in the right places, aluminum cowling, silk covering, etc., and thus was very typical of RC experimenters' first ambitions. It looked mighty bad then.

An old faithful that had seen me through several contests, a "Comet *Sailplane*," was pressed into service now. A little aluminum rudder tab was added and the radio was set into the fairing behind the pylon on some sponge rubber mounts. The batteries were put into a box which slipped snugly into the balsa tunnel through the front part of the fuselage. The 11 oz. *Ohlsson 60* was removed and an old 6 oz. *Brown Jr.* was installed. Those sky-rocket climbs are not desirable in RC work. (A good class B motor is plenty hot for a four or five pound class C model.)

Of course it flew all right, but it couldn't be controlled on the takeoff. It was found that the bouncing of the model plus motor vibration was too much for the light contact pressure of the relay. More flexible rubber mounts on the radio and a shorter, lighter prop cured these troubles. Now it could be taken off, controlled by the radio.

It was found that a flight timer on the motor was necessary as the points seemed to be closed every time the motor stopped, necessitating changing ignition batteries each flight. The old type large horizontal gas tank gave about 4 minutes running, so the timer was set for three minutes. Flights averaged 7 minutes which is enough until you are sure of your range.

My transmitter was a three stage, master oscillator, frequency multiplier, and power amplifier affair with about 25 watts output. An AC power supply fed by an alternator (made from a refrigerator motor) was powered by a worn out one-lung gas engine (purchased for $5). The homemade governor on the latter went haywire one day and burned out a tube in the transmitter while I was making adjustments. Since a spare tube was not available, we shifted to my friend William's one tube transmitter used with vibrator supply, running off the car battery.

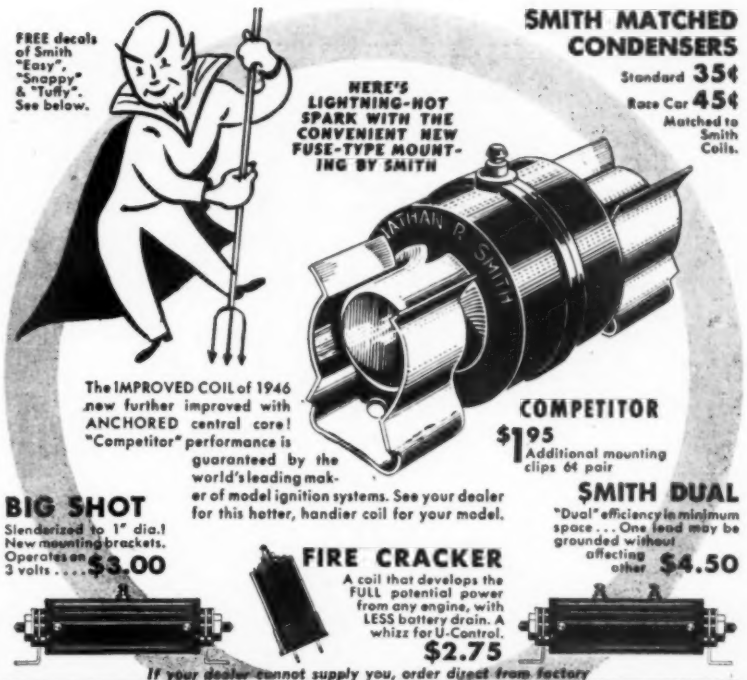
The model really outdid itself on that flight, climbing nearly out of sight before the timer cut the motor. She was put through the usual turns and figure eights on the way up—as the crowd always calls out some maneuver for you to execute—just to convince them we were really controlling it. A 360 turn to the left continued into a 720, and the control was set hard right with no result. This always means no signal; looking around at the antenna I saw a young fellow leaning against the mast, up which ran the open transmission line. Now on a multistage transmitter this would only have cut the power a little, but on a single tube self-excited job it detunes the transmitter's frequency to some extent which causes the receiver to lose the signal completely (a strong point in favor of the more stable performance of the slightly more expensive transmitter).

By the time the interference had been eliminated, the model was in a tight spin and held it right on down to the ground, nose first. It struck in a field of tall corn and, believe it or not, it was ready for another flight in 30 minutes after being returned to the flying field.

Thirty-three controlled flights were clocked up in a year with no more serious accidents. The model was repeatedly flown within inches of an obstruction with perfect confidence, and I could usually land it within reach.

The writer's goal is to build as small and light as possible, rather than produce big expensive heavy jobs that take so much time to build.

The entire equipment for rudder operation only was brought down to 8 oz. and installed in a class B pylon job with an A motor. It was impossible to find a place to mount things high enough in the fuselage to get LA and CG properly correlated, and the model would not stand much of



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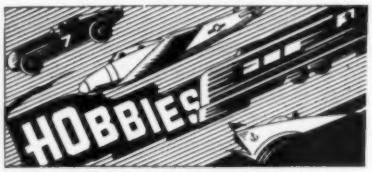

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a turn before nosing down. The climb was greater than expected or needed, although the model weighed over 3 lbs. This proved to me that a big motor is not a necessity for a limited amount of radio control. This model met a sad fate on the fourth flight when one end of the transmitter antenna came loose.

Next, a "*Vagabond*" class C (see photo) was selected and completed in three weeks. The old *Brown Jr.* was used again because it is so lightweight and easy to run. The rudder control was tried alone first, and results were such as you sometimes read about: the ship flew right off the drawing board. The weight, all up, was only 3-1/4 lbs. Using 2 pen light cells to operate the rudder actuator, which weighs 6/10 oz. itself, the installation was very light.

For years the idea has been running around in the writer's mind to operate a second control off the pulse rate. It is easily done using a couple of tubes, an input transformer, a few condensers and resistors, and the relay. But all this, plus heavier batteries for the additional tubes, adds weight too fast. There just had to be a better way—and there was.

A little energy is taken from the battery operating one of the actuators for a small enough period of time on each pulse not to affect it. Stored up in a condenser, the resultant accumulated voltage would be proportional to the applied voltage times the number of pulses per second. Then a relay coil connected across this condenser could be made to operate by varying the frequency of the pulses.

You know that only one spark comes from your ignition coil each time the points open, irrespective of how long or short a time they were closed before the break. This is the principle. It is only a matter of selecting the proper ratio transformer to produce a voltage that will match the relay operating voltage under the conditions at hand. The relay will not operate on an alternating current, and neither can AC be stored or accumulated in a condenser; thus a rectifier is necessary, but it does not have to be a tube. A copper oxide or selenium rectifier such as is used on some test meters serves the purpose. They sell for about two dollars and weigh a small fraction of an ounce.

Finally selected was an output transformer from an aircraft interphone amplifier (there are plenty of them in the junk shops). The output winding has a DC resistance of about 5 ohms, so this is connected in series with an actuator motor having 3 ohms resistance. This gives sufficient output to close the relay when it receives 6 or more pulses per second. With 4 or less pulses the relay will release.

This control was originally intended for throttle control where only two positions are required, but the writer just couldn't resist trying it on the elevators. The ground control box could be the same as used for the single control with a rheostat to change the speed of the motor.

A control was made as illustrated with three cams, one each with 1, 2 and 4 lobes, selected by the microswitches on the end of the box.

With two pulsed RF channels there can be 2 pulse frequency controls. With one of these used for the throttle, the other should be used as a safety. If the pulsing stops this relay could shut off all batteries, causing the motor to cut and the controls to neutralize. It could also release a catch on landing flaps causing the plane to settle faster. This should save some long chases after the model in case of control failure. Or the pulsing could be stopped momentarily to cut the motor and drop the flaps, then control of the pulsed channel resumed, if so connected.

Putting a rheostat of 5,000 or 10,000 ohms in the "B" battery lead of the receiver is strongly recommended because without this, voltage loss in the "B" batteries cannot be compensated for. While most radio receivers using the RK61 tube will work after a fashion when using the values given in any of the construction articles, it has been found through experience that each tube requires a slight variation in values

(*Turn to page* 80)

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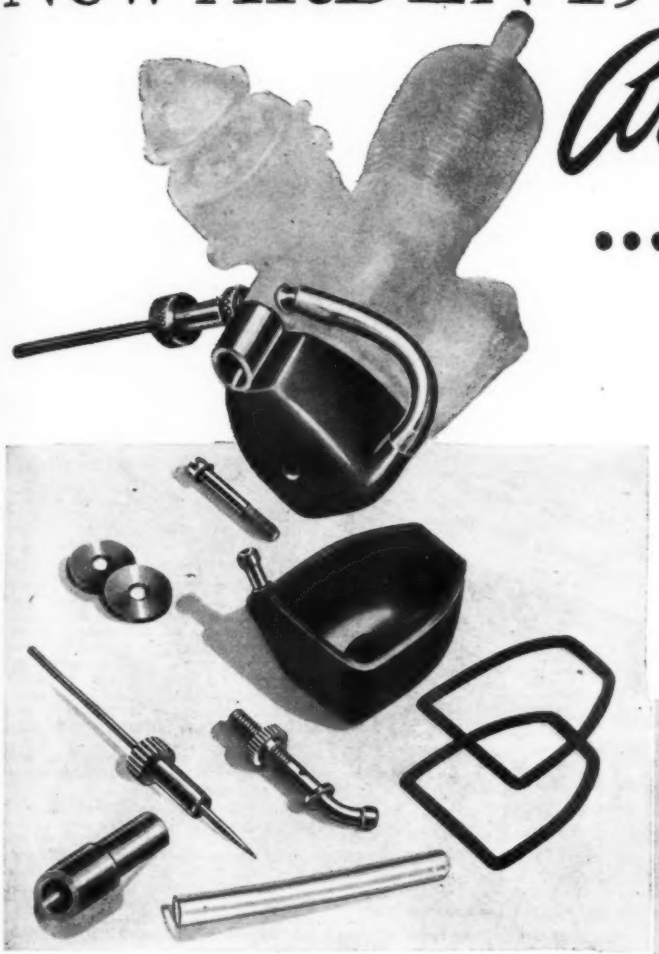

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of components to obtain the best sensitivity and steadiest operation. Also remember there is a 20% tolerance on the general run of condensers and resistors; therefore you don't always have the values marked. The most critical point in adjustment has been found to be the L/C ratio. That is the ratio of inductance in the tuning coil to the capacity across it.

One of the receivers in use before the war was set up for test, using a variable frequency signal generator. It was found that it worked ten times better at one frequency than at any other. This happened to be a frequency way above the 50-54 MC band. A new coil having more turns was substituted and then the best operating point noted, which was too low this time. The coil was clipped one turn and tried again. Each time a turn was clipped off the coil was stretched out longer to fit the supports until it was discovered that this was having quite an effect also. So starting with a new coil, each time a turn was clipped the test was repeated with several different spacings of the turns. Then the grid coupling condenser was changed and the same process repeated. Each new set of values was tried with various lengths of antenna and antenna series condenser settings. The final result was a thousand to one improvement in sensitivity and far less susceptibility to changes of the antenna (and to think it had been used successfully in its former state).

Now what about antennas? Well, a whole book can be written on this subject without fully covering all the phenomena, but here are a few high points pertinent to our conditions of operation.

I clearly remember how difficult it was to keep the people far enough away from the model not to affect the tuning. Also, when the model sat on the ground a different tuning adjustment was required than when it was up on a wooden table, and there is no telling how different it should have been when the operator himself moved away. So you see how important it is to arrive at such an adjustment that the antenna is not critically susceptible to outside influences. The greater sensitivity also means less power is required in the transmitter for any given range.

At present I am using a crystal controlled transmitter mounted in the trunk of the car. Each stage is fully shielded and the entire set is in an aluminum box. The input to the final stage is 10 watts. With no antenna attached and the trunk lid closed, the receiver will still operate the relay as much as 100 ft. away. This illustrates the fact that anything will work, up to a certain range. Conversely, without going into involved formula it will suffice to say that the power must be increased manyfold to double the distance. There is little to be gained by doubling the power in the transmitter, but with ten times as much power the difference in range is quite noticeable.

Much greater changes in range will be noted from changes in the transmitting antenna and from differences in transmitting and receiving antenna. With a horizontal antenna on the transmitter and the same on the receiver the greatest range seems possible. Most power is radiated broadside from an antenna, not off the ends, and the same is true for a receiving antenna. Therefore, with a wire running along the wing the shortest range is had when the end of the wing is pointed toward the transmitter. If a wire is run out both halves of the wing and the lead brought off the center, the range seems to be reduced considerably. If the plane antenna is made vertical the range is cut still more, but such an antenna does give a more even range horizontally. Remember that the wiring and batteries form the ground for the receiver and affect the antenna performance to a great extent as they actually become a part of the antenna system. If wires run to the tail of the ship they may become the main portion of the antenna, having as much effect as the other end. With a wire on the trailing edge for the antenna we have in effect an "L" shaped affair; this has very pronounced directional properties, being weakest between the open ends.

(*Turn to page* 83)

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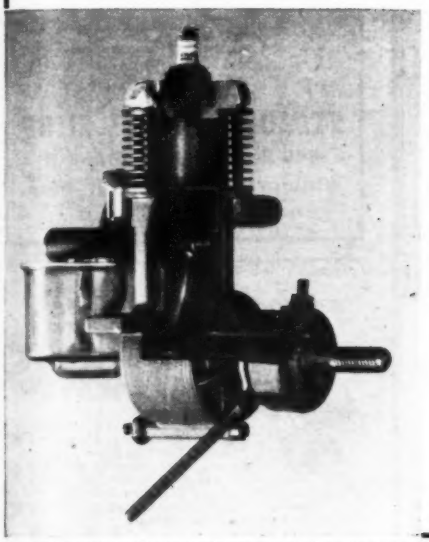

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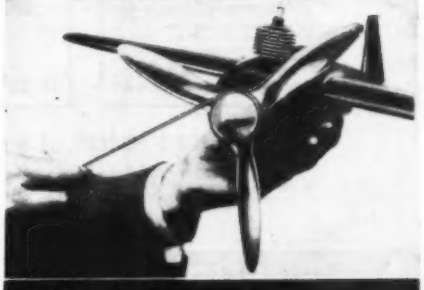

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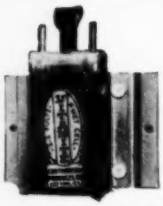

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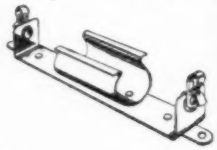

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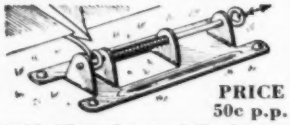

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All this assumes that the model is in level flight. When in a tight turn the wing is nearly vertical, and when the tail of the ship is toward the transmitter the poorest reception exists. As my ship turns right when receiving a signal and left with no signal, it was easy to determine when enough signal to hold the relay was reaching the receiver.

Transmitting antennas have the above characteristics plus a few more because of ground effect. Within practical limits this general rule applies—the lower the antenna the greater the range near to the ground, but the poorer the range above. With the antenna more than half a wave length above the ground the range is very short on the ground and much greater above. Quarter wave vertical antennas have little range straight above them at any height from the ground.

To conclude this complicated subject, let me tell you what I am using after all these experiences as well as a lot of study. The transmitting antenna is a horizontal folded dipole mounted a little more than half a wavelength above the ground. The models use a wire along the trailing edge of one wing. The folded dipole is a circle of 3/8 in. copper tubing, 3-1/4 ft. in diameter. A 1 in. gap is cut out of the tubing on opposite sides of the circle. The coaxial transmission line connects to the open ends at one gap, and the other gap is left open. The greatest range is in the direction of the side to which the transmission line is attached. This makes a compact installation if not the most efficient one. The tubing is supported by three spokes, forming a wheel, the hub of which fastens to the top of the supporting member mounted on the bumper of the car. (Both wooden and metal poles were tried with no difference in results noted.)

For further information on this complex subject, I suggest that you read the chapters on antennas and HF transmitters in the A.R.R.L., or some other handbook.

The writer has several other new systems worked out that may prove to be even lighter where a multiplicity of controls is desired. None of these, however, have the accuracy of control and simplicity to be found in the pulse system described herein.

(EDITOR'S NOTE: We have found that the system of pulse control developed independently by Mr. Trammell is identical in operating principles with the control system patented by Jim Walker and used in Mr. Walker's 1946 Nationals winning radio control ship. While this "proportional control" system, as it is known to experimenters in the field, is used for the same purpose by both Mr. Trammell and Mr. Walker, control equipment carried in the model differs considerably. The actuator described in this article does not offer all the advantages of that worked out by Mr. Walker, but it is much simpler and lighter and can easily be built by the average modeler.)

Plane on the Cover

(Continued from page 25)

Switzerland and the United States did not send delegates. During the course of these meetings the basic considerations of an international glider were agreed upon and these included simplicity of design, construction and flying, maximum economy of materials generally available in all countries and a design which could be built quickly and with a minimum of skill and tools by a contestant in his backyard.

The basic specifications prepared at this meeting included the following: span—15 meters (49.3 ft.); maximum weight empty—160 kg. (353 lbs.); useful load—95 kg. (209 lbs.); maximum gross weight—255 kg. (562 lbs.); fuselage crossection at cockpit—600 mm. (23.4 in.); materials—steel, plywood, pine and spruce; landing gear—skid (no wheel); terminal velocity with airbrakes—200 km-hr. (124 mph).

In February 1939 the Committee met in Rome for trials of the competing machines. The trials took place 50 miles south of Rome and only four gliders were

(Turn to page 85)

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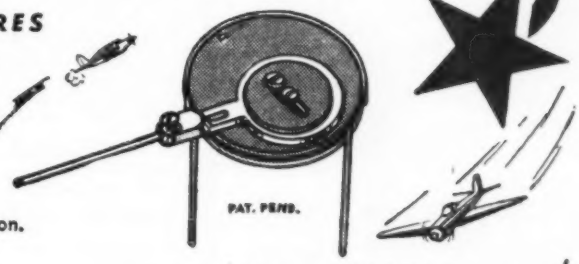

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on hand; one Polish, one Italian and two German. Five official pilots, one from each nation represented on the Committee, were on hand and each of the pilots flew all four of the gliders. These trials continued from February 19 to February 25 and after exhaustive flying, study and conferences the Committee announced the German DFS D-11 *Meise* the winner. The *Meise*, or *Tomtit* in English, was designed by Hans Jacobs at the Deutsche Forschungsanstalt fuer Segelflug, which means "German Research Establishment for Soaring Flight." This research center is located at Darmstadt and had developed a long series of gliders and soarers over the years since World War I. This machine then became officially known as the *Olympia* (or "Olympic") glider and plans were made for shipping drawings and construction data throughout the world to all interested participants in the 1940 Olympics. But on September 3, 1939.....!

During the ensuing years the Germans built about 1000 *Olympia* gliders for primary and advanced training of *Luftwaffe* pilots, although the gliders were utilized by a group similar to our own Civil Air Patrol during the war.

British Royal Air Force pilots who have flown the *Olympia* in Germany are unanimous in their opinion of its "wonderful" performance and stability. Much of this is due to the carefully developed wing design which utilizes a Gottingen 549 profile at the root and a Gottingen 676 profile at the tip. The wing has 49.3 ft. span. 159 sq. ft. area and an aspect ratio of 15. The mean chord is 3.28 ft. and the root section is 16% thick. A dihedral of 2½° is used. The *Olympia* in Germany has a gliding angle of 25:1. The wing loading is only 3.48 lbs. per. sq. ft. It weighs 353 lbs. empty and 562 lbs. fully loaded.

A single spar system is used, the spar being joined by a plywood D section leading edge comprising a torque resistant box. Rear portion of the wing, aft of the spar, is fabric covered. The spar is built up of spruce cap strips and birch plywood webs. The wing is built in two sections and joined at the fuselage centerline, thereby eliminating the use of a centersection and a complete additional set of fittings. The spar fittings are of welded sheet steel bolted in place. The ribs are spaced 14½" aft of the spar. Each of the ribs is built in a single piece and is slid onto the spar on assembly. Dive brakes are fitted which are a model of simplicity. To eliminate heavy airloads, the brakes are mounted in a spanwise direction in slots in the upper and lower surface. They are actuated by cables, the upper brake moving up and towards the tip as the lower brake moves down and towards the fuselage.

The fuselage is of plywood, semi-monocoque construction. It is a rough elliptical shape coming to a point top and bottom with a lateral member across the midsection. The frames are spaced 12" apart along the fuselage. The fin is built integral with the fuselage. The horizontal stabilizer is built up on two spars. The elevators are mass balanced. A trim tab is located on the starboard elevator.

The main skid along the bottom of the fuselage is of hardwood and is equipped with doughnut-shaped rubber shock absorber directly underneath the cockpit. The tail shock absorber actually consists of two tennis balls mounted within the skid!

Although the outbreak of war in Europe presented obvious difficulty in holding the Olympics, the International Committee proceeded with its distribution of plans of the *Olympia* glider since no official cancellation had been voted, and the plans arrived in this country in March 1940 following many delays. They were made available to members of the Soaring Society of America and interested individuals, but the conversion of the nation's interest and effort to the impending war forced the *Olympia* far into the background. One persistent glider enthusiast, Guy B. Storer, Long Island, N. Y., refused to be sidetracked. Storer spent more than five years of spare time in his home patiently making the parts for an *Olympia*, and on July 27, 1946 he was rewarded by its first test flight. Storer made a soaring flight to 5500 ft., remaining aloft 55 minutes, which is a creditable performance for even a high-performance soarer.

The *Olympia* is being manufactured in England by Chilton Aircraft at Hungerford. The Chilton *Olympia* has been slightly modified for production, although alterations have been centered largely about the detail fittings rather than any changes in design. Deliveries are under way for the popular Derbyshire and Lancashire Flying Clubs in England. Storer's version features one major change: the use of a single landing gear wheel placed behind the skid of the original. The *Olympia* is also being produced in Sweden, and plans have been completed for its importation into the U.S. by the Empress Silver Company, 2 E. 23 St., New York 10, N.Y.

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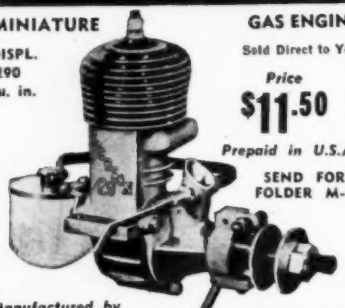

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THE LOCKHEED P-80A *Shooting Star* test aircraft assigned the Air Proving Ground Command of AAF has completed firing more than 64,000 rounds of .50 cal. machine gun ammunition. AAF specifications require that each gun in a new armament installation must successfully fire 10,000 rounds of ammunition, and this severe test has been passed by the six nose .50's of the P-80. In addition, tactical units have fired P-80 guns for many months without difficulty, thereby putting the lie to recent nonsensical news stories that jet planes could not fire machine guns!

AIRBORNE COMBAT equipment continues as a pressing study by AAF and most effort centers around maximum use of the seemingly endless capabilities of Fairchild C-82 *Packet*. A recent development is an automatic cargo salvo device consisting of an overhead metal beam running the length of the *Packet* cabin. On this rail are attached "paracans," each equipped with a parachute and containing items of equipment and supply. The paracans are spaced apart by an endless chain overhead. As the target area is approached the system is set in operation, the chain sliding the paracans aft where an automatic trip releases each into the air. Another new development is the dropping by parachute of a 2240 lb. 75 millimeter howitzer from a *Packet*. Two ribbon parachutes were used. One of the chutes is 14 ft. in diameter and is used to pull the heavy gun from the plane. Once clear of the plane the second chute, a 90 ft. model, opens and both chutes lower the huge gun to the ground. The load is placed on a ballbearing conveyor built into the floor of the *Packet* to ease the job required of the extractor chute.

THE MUCH-maligned Curtiss C-46 *Commando* may be very much back in the news during 1947 in view of its recent award of an Approved Type Certificate. Because it can carry about twice the payload of a Douglas DC-3, the flying cost per ton-mile can be about halved. In addition, all available surplus DC-3's have been snapped up and there is even an acute spare parts shortage for those now in operation. In contrast to this is the fact that the WAA now has more than 600 *Commandos* available for sale having a total value of $30,000,000. In addition, WAA has spare parts and surplus engines valued at nearly $70,000,000. The operating economy of Slick Airways, Texas non-scheduled airline using *Commandos*, provides adequate testimony, to their efficiency and practicability.

PLANS FOR training 20 Army Ground Forces officers as helicopter pilots for the new Bell YR-13 helicopters are under way with the first class now attending a special school at Bell Aircraft in Buffalo. In addition, Bell instructors are now at Fort Bragg, N.C., conducting ground maintenance and service classes. This is the first news that the YR-13's are scheduled for AGF.

GLENN L. Martin Co. announced plans for military version of the 2-0-2. This version would accommodate either 50 infantrymen-paratroopers or 15,000 lbs. of cargo. Large cargo doors, 6 ft. x 8 ft., will be fitted. Wingtip tanks will bring the total fuel capacity to 1730 gals., providing range of 2500 miles. No AAF contract for the 2-0-2 has yet been announced.

THE FAST-approaching day when the turbojet engine will compete with the reciprocating engine is heralded by announcement that the new British Metropolitan Vickers F-3 turbojet engine has a fuel consumption of .65 lbs/lb. of thrust/hour, the lowest yet announced. This unit develops 6000 lbs. of thrust, is 15' long and weighs only 2500 lbs.

MARTIN announces its six-jet XB-48 bomber is nearing completion and is scheduled for flight test this spring. Boeing announces their huge, sweptwing XB-47 will fly this year. First American jet bomber to fly is the North American XB-45, which made its first test flight in March 1947 remaining aloft 1 hr. 4 min.

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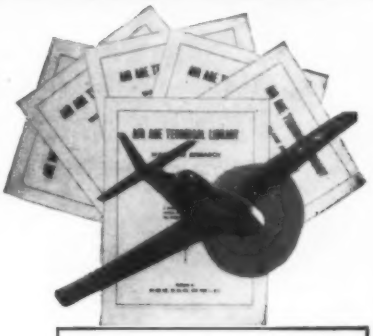

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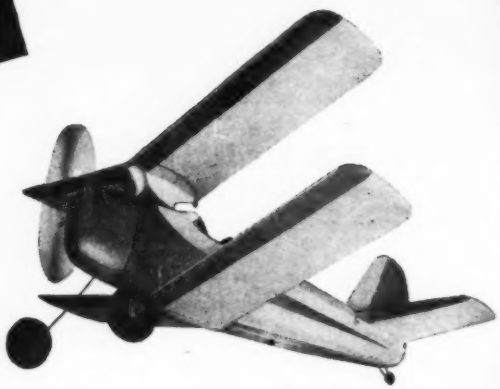

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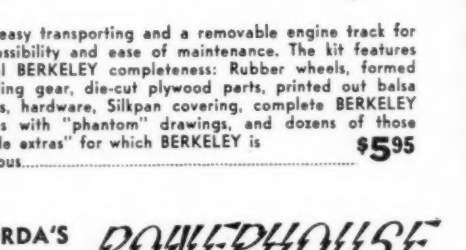

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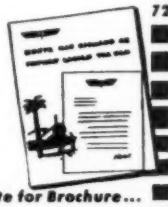

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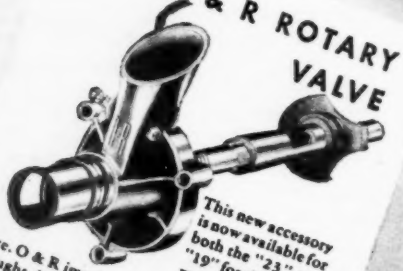

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